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SPECIAL REPORT ON
SYNTHETIC FUELS DEVELOPMENT IN THE WEST

Prepared By Staff To The
Western Interstate Energy Board/WINB
3333 Quebec Street, Suite 2500
Denver, Colorado 80207

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Executive Summary

Executive Summary

On July 15, 1979 President Carter unveiled the Administration's plans to produce the equivalent of 2.5 million barrels of oil per day of synthetic fuel. The plan called for financial subsidies to the private sector and creation of an Energy Mobilization Board to cut through red tape in permitting major energy projects.

Four days later, on July 19 the Coal Committee of the Western Interstate Energy Board, which includes all of the major Western states affected by synthetic fuels development met to draft a set of issues papers for consideration by the region's governors.

The next day, July 20, the governors of the most affected states in the West met as the WESTPO Regional Energy Advisory Board to prepare a response to the President's program. The governors endorsed the President's goal of holding the line on oil imports and pledged their best efforts to meet the Nation's energy needs, consistent with protecting the social, economic and environmental integrity of the region. Specifically, the governors proposed an "Affirmative Action Plant to Move America Toward Energy Self-sufficiency." That plan calls for:

1. A PHASED PROCESS OF SYNFUELS DEVELOPMENT

   - Because states have substantial experience with the implications of proper and improper phasing of development as well as a commitment to support increased synfuel production, it is important to the success of that program that the Federal Government look to the states to guide the siting and pace of synfuels development projects.

2. STATE-FEDERAL PARTNERSHIPS TO ACHIEVE SHORT-TERM ENERGY CONSERVATION

   - Supplies from energy conservation and renewable resources are our most readily available and reliable sources of energy. We believe that a measurably increased portion of the President's import reduction goals can be met from substantial capital investment in conservation and renewable energy.

3 STATE-FEDERAL PARTNERSHIPS TO MITIGATE UNDESIRABLE SOCIO-ECONOMIC IMPACTS

   - The states and Federal Government need to establish a partnership to insure that potential socio-economic impacts do not impede our energy development efforts. We strongly endorse a broad impact assistance program which will provide financial assistance for mitigating these impacts.

4. IMPROVED INTERGOVERNMENTAL CONSULTATION AND CONCURRENCE

- The western states must not only play a strong role in the development of appropriate legislation but additionally, we are in a strong position to work with Congress and the Administration to insure its passage and effective administration.

This staff "White Paper" provides some further elaboration of the governors' four-point plan by reviewing the role of synfuels in national energy policy, examining the production and impacts from synfuels development in the West, and discussing some of the details of the nature of a workable synfuels program envisioned by the governors.

Role of Synfuels in National Energy Policy

The sudden perception of synfuels as a cure-all for the nation's energy woes sets a dangerous course for energy policy in the United States. It will provide no short-term relief to the energy shortage because of the long construction lead times. Synfuels could provide some relief by 1990, but by quickly embracing this technology, the nation may be foregoing other more cost-effective alternatives. Various studies have examined the economics of synfuels and found it wanting when compared with certain conservation and renewable energy resource measures.

Production and Impacts from Synfuels Development in the West

Status of Synfuels Industry in the West

There are at least ten oil shale projects and 15 coal gasification or liquefaction facilities which are in some stage of planning or development in the Western states. Those numbers, however, are deceptive because the only coal synfuels plant which is far enough along to begin construction in the next couple of years and production by the mid-1980's is the Great Plains Gasification Project in North Dakota, and only a few shale oil pilot plants producing less than 10,000 bbl/d are expected by 1985.

Many of the coal synfuel projects are in a holding status or are only slowly pursuing necessary permits and resources. The sponsors are waiting for better economic incentives before investing the hundreds of million dollars which are necessary. The project closest to construction, the Great Plains Gasification Project, is pursuing a ruling by the Federal Energy Regulatory Commission as a prerequisite to development which would put the risk of the cost of the project on the ratepayers of the five sponsoring utilities.

The oil shale industry is in a similar situation, but there are several companies which are constructing or operating pilot retort facilities in anticipation of expansion at a later date. Union Oil and others have publicly claimed that they will begin operation only when a $3 per barrel tax credit or other financial incentive is provided.

The President's Goal and the West's Share

On July 15 President Carter announced his new energy program which included a goal of producing the equivalent of 2.5 million barrels per day of synthetic fuels by 1990. An accompanying White House Fact Sheet provided an "illustrative division of sources for meeting the 1990 targets:"

- coal liquids, coal gases; 1.0 to 1.5 MMB/D
- Oil shale .4 MMB/D
- biomass .1 MMB/D
- unconventional gas .5 to 1.0 MMB/D

To gain some idea of how much of this goal would come from the West, it is necessary to divide the coal synfuels part of the goal (1.25 MMB/D) into a goal for coal liquids and goals for high, medium and low Btu coal gas and then estimate how much of the production to meet these specific goals would be in Western coal producing states. Based on estimates from several sources, it is concluded that 17 to 59 percent of the coal-based synfuels production will be from high-Btu gas; 8 to 30 percent from coal liquids; and the remainder from low and medium-Btu gas. It is projected that none of the goal for low and medium Btu gas would come from the West, but 13 to 44 percent of the goal for high Btu gas and 8 to 29 percent of the goal for coal liquids would. The entire goal for shale oil is expected to come from Colorado and Utah.

Most authorities, including Western state officials, are in agreement that the President's goal is highly unrealistic. It becomes evident upon an examination of the potential and planned energy development projects in the West that it would not be possible for all of the potential development to occur because of limitations of manpower, of the environment, of resources and of socio-economic conditions. Synfuel production, conventional coal mining, uranium production, and powerplants will increasingly compete for the same resources. There are already indications in North Dakota that planned powerplants and coal gasification plants will not be permitted because existing plants and the ANG coal gasification project have used up the allowable PSD increments. Energy projects are beginning to draw water resources from agriculture production, and that trend is expected to continue. As a result, even though the West's share of synfuels development through 1990 may be a large proportion, the magnitude is expected to be small.

Cameron Engineers predict that under the status quo, only 100-250,000 bbl/d of shale oil and 100-150,000 bbl/d of coal synfuels (crude oil equivalent) is a realistic national production level by 1990. Even with government sponsored financial incentives, Cameron projects only 300-400,000 bbl/d of shale oil and 400-450,000 bbl/d of coal synfuels (crude oil equivalent) by 1990.

Table 1 summarizes the level of synfuels production which would occur under the admittedly unrealistic assumption that all projects currently under consideration would be built. It is not intended to display any potential level of production.

Table 1

SUMMARY OF PRODUCTION FROM PRESENTLY ENVISIONED COAL AND OIL SHALE SYNFUEL PLANTS IN THE WEST

	Total Production from Projects with Specified Production (b/d-barrels per day; mmcfd-million cubic feet per day)	Total Production for All Projects (Assuming 50,000 b/d, 290 mmcfd for Gasification Plants, for Projects with Unspecified Production)
Alaska		
coal liquefaction	51,000 b/d	51,000 b/d
California:		
coal gasification	67 mmcfd (3,096 b/d equiv.)	67 mmcfd (3,096 b/d equiv.)
Colorado:		
shale oil	343,000-443,000 b/d (excl. unspecified amount from Naval Oil Shale Reserves)	393,000-493,000 b/d
coal gasification	minor medium-Btu project	
Montana:		
coal liquefaction	27,000-64,000 b/d (excl. unspecified amount from project by Burlington Northern)	77,000-114,000 b/d
coal gasification	530-600 mmcfd	530-600 mmcfd (100,000 b/d equivalent)
New Mexico		
coal gasification	322-533 mmcfd (55,517-92,758 b/d equivalent)	322-533 mmcfd (55,517-92,758 b/d equivalent)
North Dakota:		
coal gasification	500 mmcfd (90,516 b/d equiv.)	500 mmcfd (90,517 b/d equiv.)
coal liquefaction	164,000 b/d	164,00 b/d
Utah:		
coal gasification	275 mmcfd (46,551 b/d equiv.)	275 mmcfd (46,551 b/d equiv.)
shale oil	150,000 b/d (excl. unspecified amount from Naval Oil Shale Reserves)	200,000 b/d
Wyoming:		
coal gasification	520 mmcfd (100,000 b/d equiv.) (excl. unspecified amounts from Carter Oil and Mobil Oil projects)	1,020 mmcfd (200,000 b/d equiv.)

Impacts From Presently Envisioned Projects

Socio-Economic. The production of synfuels in 1990 at the level the President proposes would have a substantial impact on Western states. To gain some idea of the magnitude of the impact, an analysis was made of the employment and population impact of all presently envisioned plants in Western coal and oil shale producting regions (except Alaska). Production from those plants would be near or above the estimated share of the President's goal that would be produced in the West. As indicated above, the President's goal is considered to be highly unrealistic, so the projected impacts show the extreme case of what could occur.

Table 2 contains an estimate of the population growth which would occur under projected expansions of coal mining, new powerplants, and presently envisioned synfuel plants. The date include several critical assumptions: (1) plants for which a date for beginning production has not been specified by the company were assumed to begin production by 1990; (2) plants for which a size was not specified were assumed to be full size plants, i.e. 250 mmcfd for coal gas plants; (3) plants were assumed to produce at the maximum level specified by the company; (4) where coal production for a synfuel plant has not been specified by the company, it was estimated using data from comparable plants in the West; and (5) migration into the area accounts for all new jobs and related population, which inflates the estimated population growth. Generally, these assumptions make the analysis a "worst case" analysis.

Table 2

SUMMARY OF EMPLOYMENT AND POPULATION INCREASES

IN THE WEST

RELATED TO ENERGY DEVELOPMENT AND PRESENTLY ENVISIONED SYNFUEL PLANTS

Type of Energy Production	Primary Workers by 1990	Total Population Growth by 1990
ALASKA		
Synfuel Plants (incl. related mining)	not available	
CALIFORNIA		
Synfuel Plants (incl. related mining)	not available	
COLORADO		
Oil Shale Plants (incl. related mining)	7,978 - 10,191	47,868 - 61,146
Planned Powerplants	760 - 940	5,131 - 6,346
Coal Mining w/o Synfuels	2,453	16,190
TOTAL	11,191 - 13,584	69,189 - 83,502
MONTANA		
Synfuel Plants (incl. related mining)	3,524 - 3,854	24,121 - 26,356
Planned Powerplants	539	3,638
Coal Mining w/o Synfuels	2,789	18,407
TOTAL	6,852 - 7,182	46,566 - 48,801
NEW MEXICO		
Synfuel Plants (incl. related mining)	1,871 - 2,983	11,382 - 18,018
Planned Powerplants	326	2,150
Uranium Mining and Milling	9,901	65,347
Coal Mining w/o Synfuels	1,831	12,085
TOTAL	13,929 - 15,041	91,064 - 97,700

[1]"Final Environmental Statement on the Star Lake-Bisti Regional Coal," U.S. Department of Interior, 1979.

SUMMARY OF EMPLOYMENT AND POPULATION INCREASES (Cont'd)

IN THE WEST

RELATED TO ENERGY DEVELOPMENT AND PRESENTLY ENVISIONED SYNFUEL PLANTS

Type of Energy Production	Primary Workers by 1990	Total Population Growth by 1990
NORTH DAKOTA		
Synfuel Plants (incl. related mining)	5,308	35,845
Planned Powerplants	230	1,553
Coal Mining w/o Synfuels	790	5,214
TOTAL	6,328	42,612
UTAH		
Synfuel Plants (incl. related mining)	5,813	35,472
Planned Powerplants	1,128	7,614
Coal Mining w/o Synfuels	3,253	14,546
TOTAL	10,194	57,632
WYOMING		
Synfuel Plants (incl. related mining)	4,122	28,112
Planned Powerplants	144	972
Uranium Mining and Milling	3,015[2] (6,500)[3]	19,899(42,900)
Coal Mining w/o Synfuels	4,091	27,001
TOTAL	11,372 (14,857)	75,984 (98,985)

[2]"Final Environmental Statement on Eastern Powder River Coal," U.S. Department of Interior, 1979.

[3]Calculated using EIA total uranium production estimates from *Annual Report To Congress 1978*, U.S. Energy Information Administration, Vol. 3 and uranium reserves and employment data from *Statistical Data of the Uranium Industry*, U.S. Department of Energy, January 1, 1979.

Environmental Impacts. Current air quality standards are likely to be a limiting factor for a number of the presently envisioned coal synfuels plants. For example, in North Dakota the available Class I increment for Theodore Roosevelt National Park has been taken by proposed powerplants and the Great Plains Coal Gasification Project. The NGPL gasification plant cannot receive a PSD permit under current conditions. In Montana there may be air quality problems in siting a gasification facility in the Colstrip area because Colstrip powerplants 3 and 4 may, under certain siting and meteorological conditions, use almost all the available increment related to the Class I Northern Cheyenne Indian Reservation.

There are some indications that at least some proposed oil shale plants will be able to comply with clean air requirements. The EPA has awarded several PSD permits, including a conditional permit to C-b Shale Oil Venture, and final permits to the Colony Development Operation and the Union Long Ridge Project. As with coal synfuels projects, each project will have to be evaluated for its compliance with air quality standards.

A number of studies conclude that in the aggregate there is sufficient water in the West to support a synthetic fuels industry of a size equal to the President's goal. The major issue to be resolved by the states will be the priorities of usage among the synfuels industry, agricultural users, and other sectors.

Most coal synfuels plants and above-ground retorting oil shale plants plan for zero discharges into water supplies and will comply with state and federal effluent and point source discharge standards. Techniques for coping with potential pollutants from in situ retorting processes are in the developmental stage and must continue to be developed as in the in situ technologies progress.

There are other environmental regulations yet to be developed which may have a major effect on synfuels projects. These include rules pursuant to the Resource Conservation and Recovery Act, the Toxic Substances Control Act, and the Clean Air Act Amendments of 1977.

A Workable Synfuels Program - A Western States' Perspective

Phased Development

Synthetic fuel development must occur through a "phased development" process. Pursuit of a phased approach is a direct function of synthetic fuel economic and technological constraints as well as the requirements for proper management of community growth to absorb energy development impacts.

A phased approach contrasts significantly with a "crash program" where technology would not be developed and proven in an orderly, well-managed process. The synfuel industry in particular will not develop technological processes through a so-called crash program. Technological and economic risks dictate an orderly pursuit of a variety of technologies at a number of different synfuel plants. The states and the industry do not want to limit technological progress to any one process.

Synthetic fuel development should proceed within the context of state growth management plans. Development based on technological issues alone is not flexible enough to allow government at all levels to deal with rapid changes in populations and lifestyles.

Impact Aid

Synfuel production facilities will have a major impact on communities, bringing in large numbers of workers to relatively sparsely settled areas. DOE has estimated that an average 100,000 bbl/d synfuel plant will attract 20,000 new people to the site. And of the 27 counties in the western United States that DOE has identified as capable of supporting a coal-based synfuel facility, 26 have populations below 20,000. To alleviate the impact of such a large population increase and the requisite increase in public facilities, the western states have called for the federal government to provide impact assistance.

The major proponent of impact aid is Senator Hart (CO), who has introduced an energy impact assistance bill (S 971) that would provide grants, loans and loan guarantees to the affected communities. The National Governors' Association has also developed an impact aid proposal designed to relieve the problems associated with energy development projects.

Expedited Review of Projects

Permits and Other Mandatory Requirements for Synfuels Development. A variety of federal, state, and local permits and licenses must be issued, and other mandatory requirements must be met, before oil shale and coal-related synthetic fuels will be developed. As entities created by the states, counties and other local governmental units mandate a system of local zoning and land use elements not otherwise regulated by federal and state governments. The states and the federal government, on the other hand, are independent sovereigns which have instituted a great number of environmental regulatory programs which stand apart from local governmental control.

Some of the federal requirements include (others are detailed in the text):

- Mineral leases/sales;
- Requirements for detailed exploration and mining plans;
- Clean air and clean water mandates;
- Environmental data collection and monitoring used for the preparation of environmental impact statements (EIS's), etc.;
- Requirements for the control and mitigation of impacts from toxic and hazardous substances;
- Occupational health and safety mandates as well as archeological and historic protection requirements.

The states, as well, have created regulatory systems for the sale and lease of state natural resources; mandates for the preparation and review of mining and exploration plans; and certain environmental protection demands affecting clean air and clean water as well as solid wastes.

While the potential exists for a great deal of regulatory overlap and duplication among all three levels of government, a variety of what would otherwise be federal programs (clean air and water, hazardous substance control, etc.) have been delegated to the states and are the sole responsibility of the states. As well institutional processes exist in several states which are designed to eliminate the duplication and overlap of these regulatory systems.

Energy Mobilization Board Proposals. The Senate has voted on legislation creating an Energy Mobilization Board to classify energy projects as priorities and expedite their permitting processes, and the House is expected to pass similar legislation in the near future. What is likely to emerge is a Board with the power to set expedited permitting schedules to force the federal, state and local agencies with approval authority over energy projects to make their decisions as quickly as possible. The Board will probably be authorized to make those decisions that an agency has failed to make by a specified deadline, and it may also be authorized to waive substantive federal, state or local laws.

State/Federal Cooperation in the Past. The concept of federalism has taken on a new perspective particularly over the last decade. The development of this new notion of the relationship between the federal sovereign and the individual states has been a function to a great extent of the increased awareness and concern for environmental values which come under attack with economic growth and development. Although environmental safeguards have been instituted through a variety of state and local mechanisms in the last three decades, one of the major incentives for development and implementation of statutes and regulations for the protection of the environment has emanated from the federal government.

The general scheme envisioned by the Congress to bring the states and local governments up to speed centered on the ultimate threat of federal preemption of state and local authority in situations where environmental programs were not instituted and enforced effectively. Thus, we see the Congress initially preempting state and local authority to regulate sources of air and water pollution followed by an authorization for the states to develop regulatory programs which would have to be approved by the federal sovereign before the states would be permitted such authority. Even after state programs are approved, though, the federal agencies supervise program implementation and enforcement with the ever-present threat of preemption sitting as the cornerstone of this "new federalism."

The format for these methods of state/federal cooperation that have developed over the last 15 years consists of four major facets:

- federal preemption of state and local regulatory authority;
- establishment by the federal government of "minimum performance standards" which are applied uniformly across the country and which serve as the basis for development of state programs;
- federal approval of state-developed programs is followed by an authorization to the states to implement and enforce these programs; in most instances, state program standards may be more stringent than federal minimum requirements;
- finally, the federal agencies' presence continues to drive the system through the continual development of new regulations, amendments to existing legislation and the omnipresent threat of preemption should the states not live up to minimum federal mandates.

Setting aside for purposes of this report questions of the constitutional propriety of such reliance on the general preemptive tool by a federal sovereign, other more practical questions have focused state government attention on the value of federal dominion in areas that have traditionally been assumed to be subjects of state and local responsibility. Specifically, states continue to assert their predominant and overriding interests for local control of the development and exploitation of natural resources within state boundaries.

In the Western region, in particular, the federal presence increases and the attendant state-federal conflicts are exacerbated due primarily to the massive amounts of land that are owned and managed by the federal government. In the twelve states lying West of the 100th meridian (excluding Hawaii), the amount of federally owned real estate ranges from a peak of over 90% in Alaska, through the middle ranges of 66% and 48% in Utah and Wyoming respectively, to a low of 29% in Washington. At least a third of each Western state, then, is owned, managed and jealously safe-guarded by the federal government. Unfortunately, federal lands are not situated in neat, compact, and contiguous parcels. The interspersed and "checker-boarded" nature of federal land holdings lying among private fee land as well as state-owned land, expands the divisive attitude among the various levels of government as well as the private sector.

Much of the anxiety that develops among interested parties over natural resource development projects, though, can and has been alleviated through the use of effective, but necessarily relatively new, cooperative mechanisms that the states, local governments, and federal agencies have instituted in an ad hoc situations. Although the concept of these cooperative activities is certainly simple, implementing the coordination needed for any particular project is often tedious and can last for many months before resolutions of the many problems unfold.

Despite the problems inherent in instituting new machinery for conflict resolution, the states see little benefit for initiating the preemptive capacity of the federal government through agencies like the proposed Energy Mobilization Board. Other methods of resolving problems in the siting of energy projects, as well as the regulation of resource development, have been successful in several Western states and are adequate to meet the objectives of the many parties involved in such controversial developments as an oil shale operation or a coal liquefaction plant. In fact, as suggested by a recent study completed by the National Governors' Association (NGA), project development delays emanate primarily from federal agency involvement rather than state and local government related problems.

Two specific examples of these cooperative mechanisms which are reviewed in more detail in this report are:

1) The Interagency Task Force on Power Plant Siting created by Governor Scott Matheson of Utah. The task force was instituted to arrive at a decision for siting of the Intermountain Power Project in Utah; and

2) The Colorado Joint Review Process (CJRP) which is being developed as a generic state institutional method of coordinating the responsibilities of state, federal, and local government as well as environmental interest groups and project proponents for major natural resource developments in Colorado.

In essence, the review of cooperative mechanisms in this report leads to the inevitable conclusion that the time is ripe for government to begin to develop sophisticated methods that encourage competing interests to work together for common solutions to conflict and disagreement. Government and industry must join together as partners to ensure that public needs are satisfied and to ensure that development of resources balances the need for economic growth and environmental protection. Finally, solutions to problems facing resource development in the Western states do not require the heavy hand of the Energy Mobilization Board or other new regulatory programs. They require a simple commitment from all parties to compromise and let our system of government work as it was designed.

A Recommended Approach to Cooperative Efforts. Mechanisms presently exist which can be refined and used in the future to obviate the need for extreme "crash" programs for synthetic fuel development. Most importantly, these mechanisms have been shown to work effectively in stimulating cooperative processes between each level of government as well as the private proponents of a particular energy project and other special interest groups.

The primary recommendations for cooperative state/federal efforts for the development of the western region's energy resources include:

- Establishment of methods for concurrent environmental reviews by state and federal agencies (as well as local government agencies in some instances);
- Authorization for energy project applications to be submitted jointly to federal and state agencies;
- Provisions for joint state/federal hearings and permitting procedures;
- Provisions for joint state/federal site selection, particularly for power plant sites;
- Receipt of early state expressions of acceptable development levels for particular locales; and
- Implementation of new cooperative mechanisms among state, federal, and local governments as well as project proponents and special interest groups.

One of the major components of all the recommendations cited above is the requirement that the general public be made part of the process as early as possible. The provisions for greater public input at all levels in the decision-making process will result in greater public understanding and acceptance of projects, better planning for more carefully developed projects, increased protection of the environment and generally more beneficial projects in the areas where impacts are experienced directly and for the nation as a whole.

Conclusion

The Western States generally support the development of synfuels if it is done in a manner consistent with the protection of the social, economic and environmental integrity of the region. However, it is also believed that a significant portion of the President's import reduction goals can be met from substantial capital investment in conservation and renewable energy.

Western governors have called for a phased process of synfuels development as a means of reaching both the nation's goal of attaining energy security and the West's goals of protecting the environment and humanely dealing with rapid changes in populations and lifestyles. A phased approach would contrast significantly with a "crash program" where technology would not be developed and proven in an orderly, well-managed process. Tecchnological and economic risks dictate an orderly pursuit of a variety of technologies at a number of different synfuel plants. In addition, the phased approach recognizes the requirements for proper management of community growth to absorb energy development impacts.

Western states recognize the need for state/federal cooperative arrangements to more efficiently administer the consideration of synfuels and other energy development projects. Mechanisms presently exist which can be refined and used in the future to obviate the need for extreme "fast track" legislation. These mechanisms have been shown to work effectively in stimulating cooperative processes among each level of government as well as the private proponents of energy projects and other special interest groups.

The Role of Synfuels

In

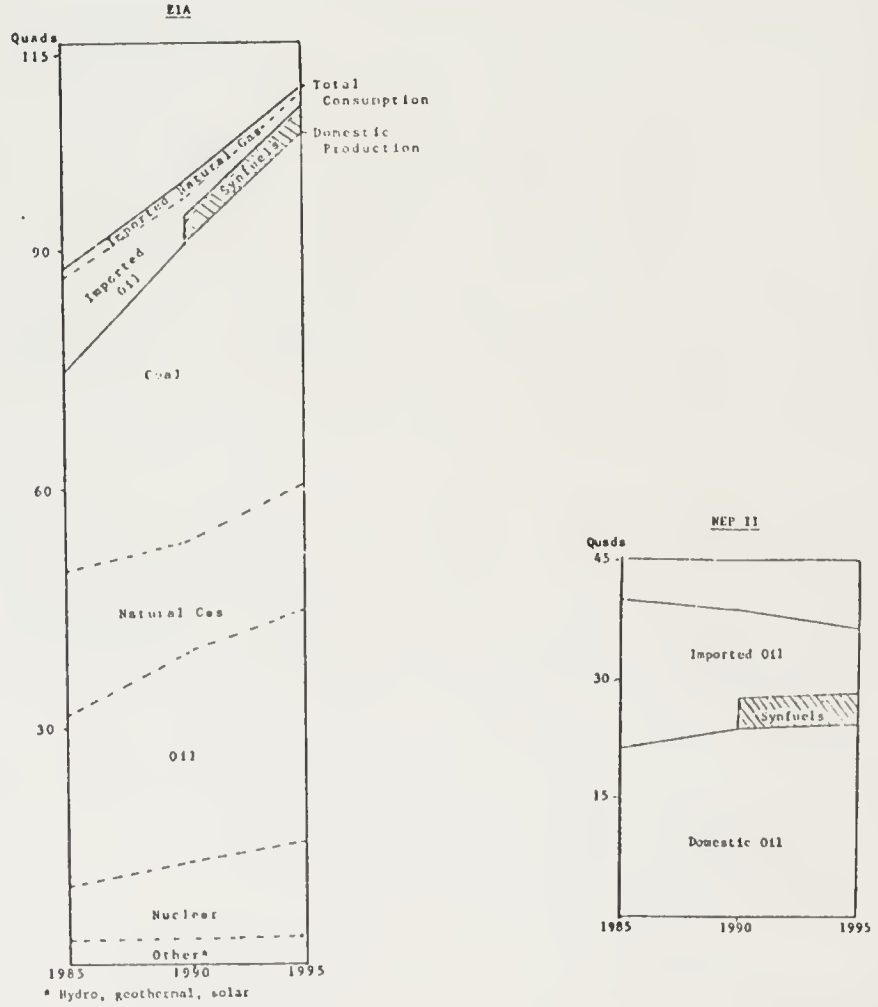
National Energy Policy

Role of Synfuels in National Energy Policy

On July 15, 1979 President Carter called for a massive campaign to increase domestic oil supply by 2.5 million barrels a day by 1990. As envisioned by the President, this increase would be met by the production of 1.0-1.5 mmb/d of coal liquids and gases, .4 mmb/d of shale oil, .1 mmb/d of biomass, and .5-1.0 mmb/d of unconventional gas. The goal to decrease the nation's dependence on foreign oil is indeed admirable, but the means should be carefully assessed before entering into an intensive program. Particularly in the case of synthetic oil and gas production, the proper perspective must be maintained by realizing the time delays and costs involved in starting up a synfuels industry and by considering alternative methods for achieving a similar oil import savings.

As Figure 1 indicates, President Carter's goal of a 1.4-1.9 million barrels a day synthetic fuels output would indeed contribute to a reduction in U.S. oil imports by 1990. The impact, however, varies greatly, depending on with which import estimates it is compared. Synthetic fuels produced at the rate called for in the President's program would supplant between 2.96 and 4.02 quads of 1990's oil imports, which are estimated at 7.79 quads by the Energy Information Administration and 15.88 quads by NEP II (National Energy Plan, Phase II). Thus, synfuels could cut imports by as much as half, or as little as one fourth.

Figure 1



Without Carter's 1.4-1.9 mmb/d program, synfuels production would realize a much slower rate of growth. In its *1978 Annual Report to Congress* submitted this July, the EIA has calculated various production levels for synfuels based on differing world oil prices. For oil shale and tar sands, EIA assumed low, medium and high world oil prices of $15, $15 and $21.50 in 1985; $15, $18.50 and $23.50 in 1990; and $16.50, $23.50 and $31.50 in 1990. For coal-derived oil and gas, EIA assumed world oil price increases of 2.5% per year from 1988-95 leveling off at $25/bbl (medium scenario), and 8% per year from 1982-95 leveling off at $35/bbl (high scenario) (all in 1978 dollars). The figures listed below include private sector capacity and "significant Federal Demonstration Projects."

Synfuels Production

(quadrillion Btu's)

	1985			1990			1995		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Coal gas (high & medium Btu)	.091	.091	.091	.705	.705	.705	1.901	2.095	2.241
Coal liquids	.068	.068	.068	.068	.068	.272	.068	.551	.952
Shale oil & tar sands	.106	.106	.106	.106	.212	.423	.318	.318	1.270
Total synfuels	.265	.265	.265	.879	.985	1.400	2.285	2.962	4.463
(Equivalent 1,000 b/d)	125	125	125	415	465	661	1,079	1,399	2,108

Thus even with "significant Federal Demonstration Projects", EIA estimates synfuels production to reach only 1.4 quads by 1990, assuming high world oil prices, as compared to the 2.96-4.02 quads that would result from Carter's 1.4-1.9 mmb/d federally-supported program.

The push for a major synfuels program gained its momentum from the 1979 oil shortage, but in fact synfuels hold no promise for relieving current supply shortfalls. This is due to the necessary lead time required to build the synthetic fuels production plants. According to the Congressional Budget Office, "Even under accelerated siting procedures, it will most likely take a minimum of 8 years to bring into production commercial-scale synthetic fuel plants that produce the equivalent of 50,000 barrels of oil per day, which is the size needed to achieve the appropriate economies of scale." Lacking such a fast-track process, the CBO claims that, "With respect to construction time, synthetic fuel plants can be compared with new nuclear power plants because both have high costs and similar siting and environmental concerns."[1] Nuclear plants now take an average of over 11 years to bring on-line.

The cost of synfuels is also of great concern, causing various authoritative sources to argue that many alternative energy technologies provide more cost-effective means for reducing oil imports. Many of these suggested alternatives carry the added advantage of offering quicker relief to current energy shortages because of their shorter lead times.

[1] *Congressional Record*, p. S10239, July 21, 1979.

An MIT study entitled "Should the Government Subsidize Nonconventional Energy Supplies" argues that, "To put it simply, at least for the next several years, conventional sources are likely to be cheaper" than synfuels. Addressing the question of how much cheaper, the study explains, "It is difficult to pinpoint just how much more expensive they /synfuels/ are than conventional energy supplies, but estimates that we have examined put them at two or more times the cost, on a thermal-equivalent basis." Based on this assessment, plus the observation that private industry apparently finds the synfuels field unattractive enough that it is unwilling to develop this resource without federal subsidies, the MIT report concludes that government intervention should be kept to a minimum. "In short, if the producers and consumers of energy who are in the best position to evaluate the commercial value of alternative energy supplies are not interested, why should the taxpayer be forced to overrule these decisions with subsidy incentives?"

The difficulty MIT has in specifying exactly how much more expensive synfuels are is understandable, considering the uncertain nature of synfuels production cost estimates. In a study prepared for DOE (*A Review of Cost Estimation in New Technologies: Implications for Energy Process Plants)*, the Rand Corp. found that the construction cost estimates of five proposed synfuels plants have jumped an average 2½ times from the first estimate to the last. (See Table 3 below.)

Table 3

COST ESTIMATE DATA FOR ENERGY PROCESS PLANTS

(In $ million 1978)

Plant	Estimate Type: Initial 1/ Year	Initial 1/ $	Preliminary 2/ Year	Preliminary 2/ $	Budget 3/ Year	Budget 3/ $	Definitive 4/ Year	Definitive 4/ $	Cost Growth
Colony Oil Shale	1972	379	1973	583	1974	721	1974	925	2.4
Occidental Oil Shale	1975	204-272	1977	473	1978	650	1978	800	3.9 - 2.9
WESCO SNG			1973 1974 1975	583 582 1017	1976 1977	1361 1390			2.4
El Paso SNG	1971	392	1972 1973	536 706	1975	1191			3.0
Great Plains SNG	1974	482	1975 1975	588 602			1978	890	1.8
Total	First Estimate	2,108			Last Estimate	5,196			2.5

1/ Initial estimates are based on engineering concepts rather than a commercial design.

2/ Preliminary estimates are made after design for the plant has begun.

3/ Budget estimates are generally made when design is at least 30 percent and usually 50 percent complete.

4/ Definitive estimates are made when project design and engineering are 90 to 100 percent complete.

The Rand study attributes the cancellation of the Colony oil shale facility to this cost growth and points to it as "instrumental in Ashland Oil's decision to withdraw its 50 percent share from the /Occidental oil shale/ project."

While the MIT study indicates that conventional energy supplies are less expensive than synfuels, other studies have also shown renewable energy sources and conservation to be more cost-effective than synfuels.

Conservation

GAO: In a 1976 GAO study of synthetic fuels, that office concluded that "certain conservation measures are by far the most cost effective way to 'produce' energy and therefore should have the top priority for Government financial assistance." Offering the greatest opportunity for conservation, according to the GAO, were insulation, greater energy efficiency in industry, and improved electrical demand management.

Kennedy/Durkin Bill: The Energy Productivity Act introduced by Senators Kennedy and Durkin is a conservation bill, with a program which its supporters claim would save 4.4 million barrels of oil a day by 1990. This is a savings of between 2.5 and 3 million barrels a day more than Carter's synfuels program, at a projected cost equivalent to only $11 per barrel of oil saved. This savings of 9.31 quads of energy in 1990 would completely wipe out EIA's projected energy imports of 7.79 quads of oil and .95 quads of natural gas.

The energy savings would be achieved by conservation programs aimed at three sectors: residential, commercial, and industrial. The residential program is modeled after Canada's highly successful Home Insulation Program. It would provide a maximum, taxable grant to homeowners, renters, and landlords of:

- $750 for single residences, with no more than $200 going for labor;

- $500 for each unit in apartment buildings of three stories or less with less than six units, with a maximum $150 per unit going for labor;

-$300 for each unit in apartment building of three stories or less with more than six units, with not more than $100 per unit used for labor;

- $200 per unit in government-owned or non-profit hotels of three stories or less, with not more than $50 per unit used for labor.

The residential program is projected to save 1.6 mmb/d of oil by 1990.

The commercial program is designed in recognition of the fact that owners of commercial property generally require high rates of return before they will invest in energy conservation, because their energy costs are usually passed through to their tenants. It provides low interest (3%) loans to commercial property owners, thus making the energy productivity investment more attractive than competing investments. The loan repayment period would be 1½ times the payback period for the conservation investment, thus improving the borrower's cash flow. The program is expected to save 0.7 mmb/d of oil by 1990.

The industrial program is composed of three elements:

- an accelerated R&D program for energy conservation;

- design and planning loans for industrial energy productivity projects;

- grants of $15/bbl of oil or natural gas equivalent saved by industrial energy productivity investments.

The R&D program, to be handled by DOE's Office of Industrial Programs, will examine technologies which should penetrate the marketplace rapidly since they offer a maximum payback period of three years. Examples of such technologies include improved aluminum reduction, fuel cell system development, coal-fired cogeneration, acetylene from coal, utility-operated cogeneration, and advanced copper reduction.

The industrial loans would be given to firms to conduct engineering studies of proposed energy-saving process changes. If it is determined that the project studied would be cost-effective, the loan would be repaid. If the project would not be cost-effective, the loan would be forgiven.

Under the industrial grant program, the federal government would pay firms $15/bbl of oil or natural gas equivalent saved through implementation of an energy-saving industrial process change. It would be a one-time rebate, under which the payee would have to certify the intention to use the new process for five years.

The industrial energy productivity program is projected to save 2.15 mmb/d of oil: 0.25 from R&D, 0.4 from loans, and 1.5 from the productivity grants.

OTA: The Office of Technology Assessment has also determined that energy conservation is a relatively inexpensive way to produce energy. In his July 26, 1979 testimony before the Senate Banking Committee, OTA director John Gibbons argues, "a vigorous program to reduce the energy used to provide heat and hot water to existing buildings could save... in the order of 1.6 million barrels per day equivalent of oil and natural gas...in 1990 at a cost corresponding to less than 50 cents per gallon." Electricity would also be conserved by this program, thereby saving fuel that would have been required to generate the electricity. Additional savings of 200,000 bbl/d could be achieved by 1990 if auto efficiency improvements were required past 1985 and by another 200,000 bbl/d if 15 percent of the commuters now commuting alone could commute by carrying one other person in the car with them. Not including the electricity savings, such a conservation program would "produce" a total of 2.0 million barrels per day or approximately 4.23 quads/yr at a much lower cost then that required for synfuels. As a result of these findings, OTA concludes that, "over the next 5 to 10 years our best options are investments in conservation."

Harvard: Even more ambitious is the Harvard Business School's Energy Project Report. In its newly-published book, *Energy Future,* the Harvard Business School Energy Project develops a "balanced program" for the "late 1980's" consisting of greater reliance on conservation and solar and less on coal and nuclear energy. The Project compared its estimates with the "conventional program" put forward by EIA in its *Annual Report to Congress, 1977*. With Harvard's "balanced" approach, energy demand in the "late 1980's" would be reduced by 10.59 quads through conservation and 4.23 quads through solar over what it would be with EIA's "conventional" approach.

CEQ: The U.S. Council on Environmental Quality issued a report earlier this year on energy conservation, in which it concluded that 30 to 40 percent of the energy used in the U.S. could be saved with today's technology. If only nine percent of that reduction could be made in oil usage, by 1990 the U.S. would have no need at all for imported oil.

Renewable Resources

GAO: According to a 1976 GAO study, there are several energy supply-increasing technologies which it found to be cost-effective throughout the country or in particular geographical areas.[2] These included "hydrothermal energy, municipal waste combustion systems, solar hot water and space heating, and tertiary oil recovery. The ultimate supply of energy to be captured from these sources may be smaller than the ultimate potential of other supply technologies such as synthetic fuels, but they appear more cost effective." Not only that, but the oil import savings from most of these methods would be felt much sooner than from synfuels production. For example, a solar water and space heating industry already exists and could be expanded in a much shorter time period, so the effects of a massive solar program could be realized quicker.

While not an established industry like solar water and space heating, municipal waste combustion systems have already been built and operated. The technical knowledge is available and it is known that construction of such systems also requires less time than that for a synfuels plant.

Hydrothermal (geothermal) energy appears to be the only technology listed by GAO that could require comparable construction lead times. It also is a relatively new technology and suffers from a lack of industry confidence because of it.

DPR: To further assess the role of solar energy in reducing oil imports, a review of the Administration's most recent major solar study will be useful. The Domestic Policy Review (DPR) of solar energy ordered by President Carter in May 1978 was widely criticized for not taking a more positive approach to the potential of solar energy. Nevertheless, even its lowest estimate of solar energy's contribution compares quite favorably with President Carter's synfuels production goals.

[2]"An Evaluation of Proposed Federal Assistance for Financing Commercialization of Emerging Energy Technologies," a report by the U.S. General Accounting Office (1976) printed in *Congressional Record*, p. S10087, July 20, 1979.

The solar estimates from the draft DPR report were made for the year 2000, while the synfuel production goals are for 1990, so a direct comparison between the figures cannot be made. Nevertheless, the solar figures do show the impact that can be made on the energy supply situation by an alternative to the massive synthetic fuels program.

The DPR task force developed three scenarios for solar use in the U.S. in 2000: a base case, a maximum practical case, and a technical limit case. Under these scenarios, the DPR concluded that excluding hydroelectric power, solar savings in 2000 would equal 3.5 quads under the base case (assuming $18/bbl world oil prices), 6.5 quads under the base case (assuming $25/bbl oil), 9.2 quads under the base case (assuming $32/bbl oil), 13.9 quads under the maximum practical case, and 18.9 quads under the technical limit case.

Conclusion

While there are good reasons for pursuing a moderate synthetic fuels program, (e.g. testing and improving technologies, learning from full scale applications, etc.) it is apparent that a massive push for synthetic fuels is not the answer to the Nation's energy problems and that all energy sources need to be pursued, particularly conservation and renewable resources. Briefly:

- synthetic fuels are not capable of producing as much fuel by 1990 as conservation and renewable resources;

- unlike conservation, synthetic fuels cannot be expected to meet the immediate petroleum shortfall; and

- the price of synthetic fuels is substantially higher than comparable investments in conservation or renewable resources.

Production and Impacts

From

Synfuels Development In The West

PRODUCTION AND IMPACTS FROM SYNFUELS DEVELOPMENT IN THE WEST

STATUS OF SYNFUELS INDUSTRY IN WEST

The synthetic fuels industry (oil shale, coal gasification and coal liquefaction) has been on the verge of taking off in the West for numerous years, but to date no commercial scale synfuels plant has been built. The status of individual projects vary from those which have received nearly all needed permits and secured financing to projects which have not yet begun feasibility studies. Tables 4, 5 & 6 describe the presently envisioned projects, including the type of plant, capacity, input, water use, air emissions, construction time, status and labor force requirements. It should be noted that many or most of the projects are in the very early stages of development, and it is virtually impossible to predict the probability that a project will be developed or the timeframe within which it would be constructed and operational. The unpredictability stems from the myriad of permitting, economic and technological factors which are the basis for decisions to develop a project. An attempt by Cameron Engineers to make a realistic appraisal of potential magnitudes of synfuels development during the next decade is contained in Appendix B.

Table 4

PLANNED COMMERCIAL SYNTHETIC FUELS PROJECTS[1]

Name of Project & Location	Type of Facility	Plant Capacity	Input MMT/yr	Water use Af/yr	Air Emissions	Construction Time	Peak Labor Force Requirements
Alaska							
Placer Amex, Beluga Coal Fields	coal liq. (methanol)	51,000 bbl/d (7500 TPD)	6				
California							
Cool Water Coal Gasification Project, Daggett, CA	coal gas	67 MMCFD (3096 bbl/d)	.37				
Colorado							
Rio Blanco Oil Shale Project, federal tract C-a Piceance Creek Basin	in situ oil shale	76,000 bbl/d	55	13,000		1979-1987	Const. 1981: 700; 1982: 700; 1983: -; 1984: 400; 1985: 400; 1986: 2200; 1987: 2200; 1988: 2200; 1989: -; 1990: - Perm. 1981: -; 1982: -; 1983: 300; 1984: 300; 1985: 300; 1986: 500; 1987: 500; 1988: 500; 1989: 1100; 1990: 1100
Superior Oil Co., Piceance Creek Basin, near Meeker, CO	oil shale	13,000 bbl/d	9.5	3,600	TSP 75.10 lbs/hr. SO_2 347 lbs/hr. NO_x 172 lbs/hr. HC 20 lbs/hr. CO 47.11 lbs/hr.	1982-1986	Const. 1980: -; 1981: -; 1982: 153; 1983: 274; 1984: 442; 1985: 790; 1986: 711; 1987: -; 1988: - Perm. 1980: 20; 1981: 50; 1982: 115; 1983: 184; 1984: 405; 1985: 539; 1986: 599; 1987: 920; 1988: 920
Union Long Ridge Project, Grand Valley, CO	oil shale	50,000-150,000 bbl/d					
Enrecon Coal Gasifier, Golden, CO	coal gas		.022			complete in 1979	

Table 4 (Cont'd)

Name of Project & Location	Type of Facility	Plant Capacity	Input MMT/yr	Water use Af/yr	Air Emissions	Construction Time	Peak Labor Force Requirements
C-b Shale Oil Venture, Piceance Creek Basin	in situ oil shale	57,000 bbl/d		4,538	TSP 74 lbs/hr. SO_2 174 lbs/hr. CO 84 lbs/hr. HC 15 lbs/hr. NO_x 588 lbs/hr.	1979-1985	Const. & Perm. 1980-82 0-900; 1982-84 700-1900; 1984-85 1400-1900; 1985-on 1600
Colony Development Operation Grand Valley, CO	oil shale	47,000 bbl/d	24	7,200	SO_2 59 lbs/hr. NO_x 369 lbs/hr. HC 66 lbs/hr. TSP 168 lbs/hr. CO 104 lbs/hr.	1981-1984[2]	Const. 1981 1500; 1982 2400; 1983 400; 1984 0; 1985 0 Perm. 1981 70; 1982 220; 1983 820; 1984 1040; 1985 1040
Chevron, Garfield County	oil shale	100,000 bbl/d					
Naval Oil Shale Reserves, Garfield County, CO, Carbon & Uintah Counties, UT	oil shale			See under "Utah"			
Montana							
Circle West Project, McCone County	coal to diesel	10-30,000 bbl/d		2.1-6.2	5-15,000		
	coal to ammonia	1-3,000 t/d		1.1-3.28	3-9,000		
	coal to methanol	17-34,000 bbl/d		1.8-3.6	4-8,000		
Burlington Northern, Timber Creek corners of McCone, Prairie & Garfield Counties	coal liq.						

Table 4 (Cont'd)

Name of Project & Location	Type of Facility	Plant Capacity	Input MMT/yr	Water use Af/yr	Air Emissions	Construction Time	Peak Labor Force Requirements
Montana Power, MT-ND Area	coal gas	30-100 MMCFD					
Montco, McCone County	coal gas	250 MMCFD	10.3			unscheduled	
Utah International, Powder River County	coal gas	250 MMCFD				unscheduled	
New Mexico							
Burnham Coal Gasification Project (El Paso), Navajo Reservation	coal gas	72 MMCFD-288 MMCFD (12,414-49,655 bbl/d)	2.4-9.4	15,000	SO_2 599.7 lbs/hr. NO_x 614.7 lbs/hr.		Perm. 1985 246
WESCO Coal Gasification Project	coal gas	250 MMCFD (43,103 bbl/d)	9.6	8,371			Const. 5,300 Perm. 1,100 mine & plant
North Dakota							
NGPL (Peoples Gas) Dunn County Project	coal gas	250 MMCFD (43,103 bbl/d)	13.9	11,750		1985-89	1985 1986 1987 1988 1989 1990 1991 Const. 700 2800 3900 3900 400 - - Perm. - - - - 612 612 612
Amax Coal Co., Dunn Center Mine	Mine			350			Const. - - 52 188 100 106 64 Perm. - - - - 281 389 474
Western North Dakota Methanol Consortium	coal liq.	164,000 bbl/d	25			20% operation within 5.5 years of project commitment	Perm. 840

Table 4 (Cont'd)

Name of Project & Location	Type of Facility	Plant Capacity	Input MMT/yr	Water use Af/yr	Air Emissions	Construction time	Peak Labor Force Requirements
Great Plains Gasification Project (ANG), Mercer County	coal gas	250MMCFD (43,103 bbl/d)	9.4	17,000			1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 Const. 524 1397 1929 1417 300 454 966 1206 1255 313 Perm. - - - 414 414 414 414 414 414 640
Coteau Mine	mine			484			Const. 130 320 250 240 30 200 200 200 - - Perm. 47 81 147 278 278 278 397 514 514 514
Tenneco Gasification Project, Beach, N.D. or Wibaux, MT	coal gas	250MMCFD	14.0	10,000			
Utah Mountain Fuel Supply proposal, Emery, UT	coal gas	275 MMCFD (46,551 bbl/d)	6.6	10,000		1985-89	
TOSCO Sand Wash Project, Uintah Basin near Vernal	oil shale	50,000 bbl/d					
White River Shale Project, Uintah Basin near Bonanza, UT	oil shale	100,000 bbl/d	58				
Naval Oil Shale Reserves, Carbon and Uintah Counties, Utah, Garfield County, CO	oil shale	The Naval Oil Shale Reserves contain 26 billion barrels of in place oil of which 22 billion are in Colorado. TRW Energy Systems has a contract to provide management support and systems engineering to formulate a master plan for full development. The objective is large scale development within five years. Construction may begin after 1982, and production would not be expected before 1987.					

Table 4 (Cont'd)

Name of Project and Location	Type of Facility	Plant Capacity	Input MMT/yr	Water Use Af/yr	Air Emissions	Construction Time	Peak Labor Force Requirements
Wyoming							
Panhandle Eastern Pipeline Co., near Douglas, WY	coal gas	270 MMCFD (46,552 bbl/d)	9.2	4,750 - 7,900	SO_2 51 lbs/hr. NO_x 86 lbs/hr. TSP 0	4 years	(Years) 1 2 3 4 5 6 7 Const. 250 1300 2800 2000 300 0 0 Perm. 0 0 0 300 800 800 800
Carter Oil (Exxon), probable location near Gillette, WY	coal gas	unk					
Texaco, Johnson-Sheridan County	coal gas	250 MMCFD (43,103 bbl/d)	12.0	8,000			Perm. 600
Mobil, near Gillette, WY	coal gas	unk					

[1]It should be noted that many or most of the projects are in the very early stages of development, and it is virtually impossible to predict the probability that a project will be developed or the timeframe within which it would be constructed and operational. The unpredictability stems from the myriad of permitting, economic and technological factors which are the basis for decisions to develop a project. The timetables which are given are those projected by the developers. Sources: "Synthetic Fuels Quarterly Report," Cameron Engineers, Sept.1979; "Final West-Central North Dakota Regional Environmental Impact Study on Energy Development," U.S. Department of Interior, October 1978; "Draft West-Central Colorado Coal Environmental Statement," U.S. Department of Interior, 1978; "Modifications to Detailed Development Plan for Oil Shale Tract C-b," Ashland Oil, Inc., and Occidental Oil Shale Inc., February 1977; "Rio Blanco Oil Shale Project Detailed Development Plan," Gulf Oil Corporation and Standard Oil Company, March 1976; "Draft Environmental Statement on the Proposed Superior Oil Company Land Exchange and Oil Shale Resource Development," U.S. Department of the Interior, 1979; "Draft Environmental Impact Statement on the Proposed Development of Oil Shale Resources by the Colony Development Operation in Colorado," U.S. Department of Interior, 1975; "Presentation to the Utah Interagency Task Force on Power Plant Siting," Mountain Fuel Supply Company, April 10, 1979; "Coal Gasification: A Technical Description," Pacific Coal Gasification Company and Transwestern Coal Gasification Company, January 1, 1977; "Final Environmental Statement on El Paso Coal Gasification Project," U.S. Department of Interior, February 1977; "Cool Water Coal Gasification Project," Southern California Edison Company and Texaco; "Final Environmental Statement on Eastern Powder River Coal," U.S. Department of Interior, 1979; and "Environmental Assessment for a Proposed Coal Gasification Project," Wyoming Coal Gas Company, and Rochelle Coal Company, October 1974. Experimental and test facilities are not included in this table.

[2]Construction date assumes increased financial incentive such as $3 barrel tax credit.

Table 5

SUMMARY OF STATUS OF WESTERN COAL SYNTHETIC FUELS PROJECTS

	Unannounced	Feasibility Study	Resources Acquired	Water Rights Acquired	ES or Development Plan Completed	In Permit Stage	In Construction Stage	Remarks
Alaska								
Placer Amex		X	X					beginning feasibility study; minimum of 6-8 yrs. expected for permitting; need subsidy to attract investors; examining foreign and domestic West Coast markets
California								
Cool Water Coal Gasification		X		X		X		construction permit expected from California Energy Commission in 1979; expected to fire existing 65 Mw boiler by early 1983 and new combined cycle unit (90 Mw) by late 1983
Colorado								
Enrecon Coal Gasifier		X	X	X	X	X	X	a fluidized bed, medium-BTU process; the 60 TPD pilot plant is currently under construction, with completion scheduled for November 1979; preliminary design work is under way for a scaled-up 600 TPD pilot plant
Montana								
Circle West		X	X					filed for 67,000 AFY from Fort Peck Reservoir; studying feasibility of locating on BN owned Dreyer Brother's Ranch near McCone County
BN Liquefaction	X							informal inquiries made to DOI, re: dedication of DOI and BN lands to synthetic fuels production
Montana Power	X							filed long-range plan with state which indicates a plant may be built, but size, location, etc. unspecified; proposals for feasibility study under review by U.S. Air Force
Utah International	X							filed a preliminary long-range plan with state indicating it would develop its coal reserves for gasification pending more favorable economics, water acquisition, and coal lease acquisition
Montco	X							has made public presentations to local planning board concerning efforts to acquire necessary leases
New Mexico								
El Paso		X	X		X	X		initial plant capacity will be 72 MMCFD but can be expanded to 288 MMCFD; final negotiations with Ruhrgas underway; sponsors to file for Certificate of Public Convenience and Necessity with FERC during 1979

Table 5 (Cont'd)

	Unannounced	Feasibility Study	Resources Acquired	Water Rights Acquired	ES or Development Plan Completed	In Permit Stage	In Construction Stage	Remarks
WESCO								formal application for business permit in 1978 was rejected by Navajos; WESCO is evaluating alternative locations in several western states; project may be changed in new location; expect to have site chosen by end of 1979
North Dakota								
NGPL		X	X		X	X		not expected to produce before early 1990's; state cannot grant air permit because PSD increments already utilized; announced on 3/15/77 that project sponsor People's Natural Gas is joining the ANG project; further action under review
Methanol Consortium		X						a preliminary study has been completed but the project has not yet started
ANG		X	X	X	X	X		awaiting FERC rate approval prior to beginning construction
Tenneco		X	X	X				environmental baseline data gathering since 1974; currently acquiring coal resources; likely location between Wibaux, MT and Beach, ND; coal requirements expected to be 1/3 from North Dakota and 2/3 from Montana; petitioned Yellowstone River Compact Commission in 1977 for water rights for two unspecified coal gas plants near Beach, ND and Gillette, WY
Utah								
Mountain Fuel Supply		X						proposal approved by the State/Federal Interagency Task Force on Powerplant Siting in September 1979; site studies and resource acquisition planned for 1979-80; operation to begin in 1990
Wyoming								
Panhandle Eastern		X	X	X	X	X		inactive but could be on-line quickly is subsidies provided
Carter Oil		X	X	X				in process of conducting feasibility study

Table 5 (Cont'd)

	Unannounced	Feasibility Study	Resources Acquired	Water Rights Acquired	ES or Development Plan Completed	In Permit Stage	In Construction Stage	Remarks
Texaco	X		X	X				beginning an 18 month feasibility study; likely to be built near Texaco's Lake DeSmet Reservoir property which contains coal and water for the project; joint venture between Texaco and Transwestern Pipeline Co., a subsidiary of Texas Eastern Transmission Corp.
Mobil	X		X	X				no announcement of plans but has acquired a coal lease near Gillette; has water rights from the Hole in the Wall Reservoir, Johnson County.

Table 6

Summary of Status of Western Oil Shale Projects[1]

Colorado

C-b Shale Oil Venture

EPA issued conditional PSD permit 12/16/77. Construction of two head frames, one for the main shaft and one for a subsidiary ventilation shaft has been completed. Operator intends to develop two full scale retorts measuring 200 feet square by 310 feet high, with the expectation that the first retort will be ready for processing by early 1985. The operator anticipates the commercial facility will reach full production in 1988 with approximately 40 retorts operating in various stages of burn and an anticipated very optimistic production of 57,000 barrels of shale oil per day.

Colony Development Operation

Final EIS issued in 1977. EPA issued a PSD permit to the project in July 1979. Operators awaiting federal subsidy legislation to activate project. Under the most favorable conditions Colony could not start construction on a plant until 1980 and thus 1984-5 is the very earliest that any production would be realized.

Rio Blanco Oil Shale Company

EPA awarded PSD permit on 12/16/77. According to schedule, the first retort would be started in 1980 and the last retort would be completed in 1981 for the test stage. Production from these retorts is estimated to reach approximately 4,000 bbl/d by 1985. Commercial phase operations would start in 1981 with the start of production from this phase not being obtained until 1987 or later. As of May 1979, shaft depth was 846 feet with scheduled competion at 971' and outfitting in August of 1979.

Multi-Mineral Project (Superior Oil Co.)

Draft EIS has been issued on land exchange with the Bureau of Land Management which Superior must have to develop their properties. With a construction period of a single module of 3-4 years, there is therefore some doubt that the 12,500 bbl/d production by the year 1985 projected by Superior can actually be obtained.

Union Long Ridge Project

Current plans are to proceed with a 9,000 bbl/d prototype facility before expanding to commercial production. Union has performed its engineering design and environmental studies for the prototype and anticipates a three year construction period once the modular commercial construction decision has been made. Pending results of the operation of the first module, Union would then make decisions for expansion to a plant size at or in excess of 50,000 bbl/d. Union has announced that it will proceed with production if Congress passes a $3 per barrel tax credit. EPA issued conditional PSD permit 7/31/79.

Table 6 (Cont'd)

Navy Oil Shale Reserves

The Navy Oil Shale Reserves (NOSR's) 1 and 3 occupy 55,000 acres in Garfield County, CO and NOSR 2 comprises 90,400 in Carbon and Uinta Counties, UT. The Navy has assigned a contract to TRW Energy Systems, Inc. to provide management support and systems engineering to formulate a master plan for full development of the NOSR's. TRW will provide their services from 1978 through 1982 and commercial construction would be anticipated to start sometime after that date. No production is anticipated from the Naval Oil Shale Reserves prior to 1987. Comparative analysis of NOSR 1 and eight other Piceance Creek basin properties has been completed.

Chevron

Chevron has notified state officials of its intent to develop a project on its land in Garfield County. It is currently drilling 30 core holes. Chevron says its specific plans and timetable depend in part on the type of incentives for shale development passed by Congress, though it may build the facility within 10 years. Chevron prefers "front-end" incentives, such as accelerated depreciation or increased investment tax credits, to production incentives, such as per barrel tax credits. No decision has been made on the technology to be used.

Utah

TOSCO Sand Wash Project

TOSCO is committed to spend a minimum of $8 million on pre-development by 1985. Process and engineering work is underway. Environmental assessment is also underway. TOSCO has drilled a core hole on the site as a preliminary step to shaft sinking and establishment of a test mine.

White River Shale Project

The operators are Phillips, Sohio and Sunedco. Their federal leases of tracts U-a and U-b have been suspended by federal court injunction based on a State of Utah challenge of the federal government's title to the tracts. The U.S. District Court and Court of Appeal have ruled in favor of the State of Utah, and the case is currently being appealed. The schedule of production cannot be forecast. Their plans call for an initial production of 10,000 tons per day of oil shale. If successful, it would be followed up by a commercial plant which would produce 100,000 bbl/d of shale oil.

Geokinetics, Inc.

This is a research and development project, but it is currently the only producing project in Utah. Geokinetics has been conducting field tests to develop horizontal in situ retorting technology since 1973. Obtained ERDA contract 7/77 to develop technology in thin horizontal beds of oil shale in Uintah County, Utah. Total production to end of 1978 was 5,437 barrels.

Tar Sands Projects

There are two or three companies which are reportedly looking into the possibility of building a commercial tar sands facility, but no details have been revealed to the public.

[1]Sources: "Oil Shale in Colorado 1979," Colorado Energy Research Institute, January 1979; "Synthetic Fuels Quarterly Report," Cameron Engineers, September 1979.

THE PRESIDENT'S GOAL AND THE WEST'S SHARE

On July 15 President Carter announced his new energy program, including a goal of producing the equivalent of 2.5 million barrels per day of synthetic fuels by 1990. An accompanying White House Fact Sheet provided an "illustrative division of sources for meeting the 1990 targets:"

• coal liquids, coal gases;	1.0 to 1.5 MMB/D
• oil shale;	.4 MMB/D
• biomass; and	.1 MMB/D
• unconventional gas	.5 to 1.0 MMB/D

For purposes of analysis, we have assumed that this breakdown represents goals of 1.25 MMB/D of coal liquids and gases and 400,000 BD of shale oil.

To gain some idea of how much of this goal would come from the West, it is necessary to divide the coal goal (1.25 MMB/D) into goals for coal liquids and goals for high, medium and low Btu coal gas and then estimate how much of the production to meet these specific goals would be in Western coal producing states. The estimate of the amount of coal liquids and various coal gases which would be produced was done using three different sources; (1) the DOE commercialization strategy reports for coal liquefaction, high-Btu, medium-Btu, and low-Btu coal gases (December 1978); (2) the Energy Information Administration's *Annual Report to Congress 1978,* Volume Three, Supplement One; and (3) the "Synthetic Fuels Quarterly Report"by Cameron Engineers, Inc., (September 1979). In addition it was assumed that none of the low or medium-Btu coal gas would be produced in Western coal producing states because of the need to convert the coal near the point of consumption, which would be most likely in heavily industrial areas where the gas would be used as a substitute for fuel oil. This does not negate the fact that osme of the coal that would be used for making medium and low-Btu gas would be mined in the West. In fact, that is the case for a medium-Btu coal gas plant planned in southern California.

For high-Btu gas it was assumed that 75 percent would be provided in the West, based on the proposed projects identified by Cameron Engineers. However, it is highly possible that all the first generation high-Btu coal gas plants could be located in the West, because at present the most developed commercial technology available is the Lurgi process which works well with Western coals, but breaks down when Eastern caking coals are used. All of the gasification proposals in the West use the Lurgi process, while of the two major Eastern proposals one uses HYGAS technology, which DOE believes will not be commercially viable until the early 1990's because of long lead times required to demonstrate the commercial prototypes, and the other has not specified a technology.

In the case of oil shale, it is a near certainty that all the near-term plants will be built in the West and that was assumed in the analysis.

Table 7 shows the calculations used to estimate the amount of production of the various coal gases and coal liquids, the percentage of the President's goal which may be produced in the West, and the amount of fuel that represents. The variation in the estimates is substantial and therefore the reliability of the estimates is not certain. Briefly Table 7 concludes that 17 to 59 percent of the coal-based synfueld production will be from high-Btu gas; 8 to 30 percent from coal liquids; and the remainder from low- and medium-Btu gas. Of the expected high-Btu gas production 75 percent would come from the West.

Table 7

ESTIMATED AMOUNT OF PRESIDENT'S COAL-BASED SYNFUELS GOAL FROM WEST

	Distribution of Synfuel Production Among Various Coal Technologies	Percent of Production in Western Coal Producing States	Estimated Percent of Carter's 1990 Goal From the West (1.25 mmbbl/d)	Calculated Barrels/Day From West Under Carter's 1.25 mmbbl/d goal
Low Btu Gas				
DOE commercialization reports	5%	0%	0%	0
EIA (No estimate made)	N.A.	N.A.	N.A.	N.A.
Cameron	1%	0%	0%	0
Medium Btu Gas				
DOE commercialization reports	70%	0%[1]	0%	0
EIA	35%	0%[1]	0%	0
Cameron	10%	0%	0%	0
High Btu Gas				
DOE commercialization reports	17%	75%[2]	13%	163,000
EIA	37%	75%[2]	28%	350,000
Cameron	59%	75%[2]	44%	550,000
Coal Liquid				
DOE commercialization reports	8%	95%[2]	8%	100,000
EIA	28%	95%[2]	27%	338,000
Cameron	30%	95%[2]	29%	363,000
CALCULATED TOTAL BARRELS FROM WEST IN 1990				
Using DOE commercialization reports				263,000
Using EIA data				688,000
Using Cameron data				913,000

[1]It is assumed that no plants will be located in Western coal producing areas because medium Btu gas is most substitutable in the chemical, refinery, and steel industries and can only be economically transported 50-100 miles.

[2]Based on proposed high-Btu plants identified by Cameron Engineers; note, however, that the currently developed Lurgi technology is not applicable to eastern caking coals.

The level of synfuels development which is possible in the next decade is currently the subject of much debate, but most authorities agree that the President's goal is highly unlikely to be attained under any set of conditions. Western state officials generally agree with the majority view that a magnitude of development approaching the goal is logistically impossible due to limitations in the ability to increase coal production, in water availability, in manpower availability, and countless other problems.

Cameron Engineers recently prepared a report on the "Overview of Synthetic Fuels Potential to 1990" for the Synthetic Fuels Task Force of the Senate Budget Committee which attempts to project realistic levels of synfuels production under three scenarios ("cases").[1] Under Case 1 a test program would be initiated to establish a proven technology base which can be relied upon as the foundation for a synthetic fuels industry, Any project which is economically viable on its own merits would receive government encouragement, and a limited number of first-of-a-kind commercial plants would receive incentives. The Cameron projections for oil shale production under Case 1 are shown in Table 8. The probable production range represents a discount on the total because of the likelihood: (1) that initial plants will require several years to reach design production; (2) of some schedule slippage, and (3) that not all of the developing technologies will prove viable.

TABLE 8

SHALE OIL PRODUCTION-Case 1

Project Name	Shale Oil Production (Barrels of Oil Per Day) 1985	1990
Union Oil, Long Ridge Project	9,000	9,000
Rio Blanco Oil Shale Co. (C-a tract)	2,000	76,000
C-b Oil Shale Project (C-b tract)	1,000	57,000
White River Oil Shale Project (U-a/U-b tracts)	-	10,000
Paraho*	4,000	4,000
Colony Development Company	-	46,000
Tosco Sand Wash Project	6,000	6,000
Superior Oil Project	-	4,000
Geokinetics*	1,000	1,000
Equity*	1,000	1,000
[illegible] (Currently Unidentified)	1,000	9,000
TOTALS	25,000	223,000
PROBABLE RANGE	10,000 - 25,000	100,000 - 150,000

*Not listed in the tables of commercial projects because currently considered to be R and D projects.

The Case 1 coal synfuels production is based on the assumption that the Great Plains Gasification Plant (ANG) will be the only commercial project to come on-stream by 1985. The summary of the Case 1 production levels are in Table 9. Neither the coal synfuels nor the shale oil production potential would attain the President's goals.

[1]See Appendix B for the complete section from the report describing the three scenarios.

Table 9

Production Potential - BPD of Crude Oil Equivalent

	1985	1990
Oil Shale	10,000 - 25,000	100,000 - 150,000
Coal	50,000 - 75,000	100,000 - 150,000

The Case II scenario assumes a significantly accelerated program which is intended to achieve a maximum production of synthetic fuels without incurring major distortions in the economy or infrastructure. Government action would be taken to remove financial and regulatory impediments for such a program. The main assumptions for the predictions in Table 10 are that currently planned projects would more rapidly develop from modular to commercial developments, and other parties not now active in oil shale projects, but who have some oil shale ownership, would be expected to participate. The President's goal for shale oil could be met under Case II.

TABLE 10

SHALE OIL PRODUCTION - Case II

Project Name	Shale Oil Production (Barrels of Oil Per Day) 1985	1990
Union Oil, Long Ridge Project	9,000	50,000
Rio Blanco Oil Shale Co. (C-a tract)	5,000	76,000
C-b Oil Shale Project (C-b tract)	5,000	57,000
White River Oil Shale Project (U-a/U-b tracts)	-	100,000
Paraho[1]	4,000	4,000
Colony Development Company	25,000	46,000
Tosco Sand Wash Project	10,000	50,000
Superior Oil Project	1,000	25,000
Geokinetics[1]	2,000	2,000
Equity[1]	1,000	1,000
Naval Oil Shale Reserves	-	-
Other Parties (Currently Unidentified)	1,000	50,000
TOTAL	63,000	441,000
PROBABLE RANGES	45,000 - 60,000	300,000 - 400,000

[1]See fn.2 for Table 8

Cameron has calculated that coal synfuels will not be economic until 1990, so a requirement for Case II production will be government financial incentives. In their development of the proposed production schedule in Table 11, Cameron assumed that development would be dispersed to mitigate environmental and socioeconomic impacts and that production would occur approximately 60% in the West and 40% in the East, due to the difficulties of processing eastern caking coal in first generation conversion plants. Production under Case II is only one-third to one-half of the President's goal.

Table 11

POTENTIAL COAL SYNFUELS PRODUCTION FROM CASE II,
THE ACCELERATED ENGINEERING PROGRAM
(All Production From Commercial Plants)[1]

Year	Plant Type	Capacity, BPD[2]	Location
1984	Lurgi-SNG	21,000	Ft. Union Region
1985	Lurgi-SNG	11,000	San Juan
1986	Methanol	50,000	Ft. Union
	Lurgi-SNG	42,000	Powder River
	Fischer-Tropsch	50,000	Illinois Basin
1987	Methanol	50,000	Central Appalachia
	Lurgi-SNG (expansion)	31,000	San Juan
1988	Lurgi-SNG (expansion)	21,000	Ft. Union
	Methanol	50,000	Powder River
	2nd Generation-SNG	42,000	Illinois Basin
	2nd Generation-SNG	42,000	Northern Appalachia
1989	2nd Generation-SNG	42,000	San Juan
	SRC	50,000	Central Appalachia
	2nd Generation-SNG	42,000	Kaiparowits
	Methanol	50,000	Texas Gulf
	TOTAL	594,000	
	PROBABLE RANGE	400,000-450,000 BPD	

[1]Production from demonstration plants will total approximately 30,000 - 55,000 BPD by 1985

[2]Crude oil equivalent; SNG plants have 250 MMSCFD capacity.

Case III involves a national "crash" effort to install maximum production capacity. Such an effort would be constrained only by the lack of resources, water supplies, logistical factors, or by the engineering and construction capabilities of the Nation. Under a crash program, the assumption is that the requirements for maximum production of the most useful fuels at the lowest overall production cost, places major emphasis on oil shale development. Large scale developments are targeted for each major oil shale property currently in existence in Table 12 .

TABLE 12

SHALE OIL PRODUCTION-Case III

Project Name	Shale Oil Production (Barrels of Oil Per Day) 1985	1990
Union Oil, Long Ridge Project	25,000	150,000
Rio Blanco Oil Shale Co. (C-a tract)	50,000	300,000
C-b Oil Shale Project (C-b tract)	50,000	76,000
White River Oil Shale Project (U-a/U-b tracts)	-	100,000
Paraho[1]	-	-
Colony Development Company	25,000	46,000
Tosco Sand Wash Project	10,000	50,000
Superior Oil Project	1,000	40,000
Geokinetics[1]	1,000	10,000
Various True In-Situ Projects	1,000	10,000
Naval Oil Shale Reserves	25,000	100,000
Other Parties (Currently Identified)	30,000	150,000
TOTAL	218,000	1,032,000
PROBABLE RANGES	100,000 - 200,000	700,000 - 1,000,000

[1]see fn.2 for Table 8.

Under the assumption that oil shale would be the top priority fuel under a crash program, Cameron predicts coal synfuels production would probably be in excess of that outlined for Case II, up to the level imposed by logistics or engineering/construction capability constraints. As a result of the expected interaction of the demands of the oil shale effort with the demands of the coal synfuels effort, the probable 1990 range of coal synfuels production is predicted to be 750,000 to 1,000,000 BPD. The total production potential for shale oil and coal synfuels of 1,450,000 - 2,000,000 BPD would come close to the President's aggregate goals but would consist of a greater shale oil production than called for by the President.

IMPACTS FROM PRESENTLY ENVISIONED PROJECTS

The production of synfuels in 1990 at the level the President proposes (400,000 b/d of oil shale, 1.0-1.5 mmb/d of coal gases and liquids) would have a substantial impact on Western states. To gain some idea of the magnitude of the impact, an analysis was made of the impact of all presently envisioned plants in Western coal and oil shale producing regions (except Alaska). Production from those presently envisioned plants would be near or above the estimated share of the President's goal that would be produced in the West. As mentioned above, the President's goal is considered to be highly unrealistic, so the projected impacts show the extreme case of what could occur.

Socio-Economic Impacts

The following state-by-state tables were prepared to provide a basis for estimating the possible impact of synfuels development. Because the impact of synfuels development cannot be considered in a vacuum, rough estimates of other projected energy related development in the region were included in the analysis.

The estimate of future coal production was taken from DOE's latest (April, 1979) production goals for Western coal basins and state agency projections. (Note that the DOE's numbers include a minimal amount of production for synfuels--9.2 million tons/year for the entire West.) Future powerplants data comes from regional utility forecasts (WSCC, MAPP and EPA) and state agencies. (See Appendix A) Data on projected synfuel plants is derived from a variety of sources and include several critical assumptions: (1) plants for which a date for beginning production has not been specified by the company was assumed to begin production by 1990; (2) plants for which a size was not specified were assumed to be full size plants, i.e., 250 mmcfd for coal gas plants (3) plants were assumed to produce at a maximum level specified by the company (no allowances were made for modular development); and (4) where coal production for a synfuel plant has not been specified by the company it was estimated using data from comparable plants in the West.

The estimates of permanent workers for the mining, powerplants and synfuel plants were derived from available EIS's and industry and government studies. Total population growth figures were calculated from the permanent primary industry workforce using data from a Los Alamos Laboratory study, which coincides fairly closely with other estimates. Note that the total population growth figures assume that migration into the area accounts for all new jobs and related population and that the newly created jobs are not taken by existing residents of the area.

Generally, these assumptions make the analysis a "worst case" analysis, with the exception that the basic coal production estimates in some areas may increase the next time DOE prepares its production goals because of the new higher prices for imported oil. The other caveat is that the analysis only considers permanent workers and not construction workers. As past experience relates, often the unplanned for infusion of construction workers can cause greater socio-economic problems than the permanent workforce. However, the analysis assumes that a coordinated industry-state, local and federal government effort could substantially reduce the impacts during the construction phase.

Table 13

ESTIMATES OF POPULATION GROWTH IN COLORADO RELATED TO COAL MINING AND COAL-FIRED POWERPLANTS

		Coal Production (mm T/y)			Cumulative Growth in Primary Workers (Permanent)[1]		Cumulative Growth in Total Population[2]	
		1977	1985	1990	1985	1990	1985	1990
Coal Mining w/o Synfuels[7]	High	-	23.9	37.9	1600[6]	3467[6]	10,560	22,882
	Medium	11.9	24.7	30.3	1707[6]	2453[6]	11,266	16,190
	Low	-	23.8	32.7	1587[6]	2773[6]	10,474	18,302
Planned Powerplants								
Craig 3 (400 Mw; Startup 7/83)					96	96	648[4]	648[4]
CO Ute, Moon Lake (1760 Mw; Startup unknown - assumed 1990)					-	422	-	2849[4]
Moon Lake (250-1000 Mw; Startup unknown - assumed 1990)					-	60-240	-	405-1620[4]
CO Ute (760 Mw; Startup unknown - assumed 1990)					-	182	-	1229[4]
TOTAL (medium coal projections)		11.9	24.7	30.3	1803	3213-3393	11,914	21,321-22,536

ESTIMATES OF POPULATION GROWTH IN COLORADO RELATED TO OIL SHALE PLANTS

	Cumulative Primary Growth in Primary Workers (Permanent)		Cumulative Growth in Total Population	
Oil Shale Plants				
Rio Blanco Project (76,000 bbl/d; Startup - 1987)	300	1100	1800[5]	6600[5]
Superior Oil Co. (13,300 bbl/d; Startup 1987) -	539	920	3234[5]	5520[5]
Union Long Ridge Project (50,000 - 150,000 bbl/d; assumed startup 1990)	-	1106-3319[3]	-	6636-19914[5]
C-b Oil Shale Project (57,000 bbl/d; Startup 1985)	1660	1600	9600[5]	9600[5]
Colony Development (47,000 bbl/d; Startup 1984)	1040	1040	6240[5]	6240[5]
Chevron (100,000 bbl/d; Startup 1990)	-	2113	-	13272[5]
Naval Oil Shale Reserve - initial study	N.A.		N.A.	N.A.
TOTAL	3342	7970-10,191	20 74	47868-61146
TOTAL FOR COAL-RELATED AND OIL SHALE-RELATED POPULATION GROWTH	5342	11191-13584	32788	69189-83502

[1]This is an estimate of the number of workers directly employed by the new energy facility. It does not include construction workers.

[2]This is an estimate of the total direct and indirect employment and related population increase related to the new energy facility. Note that the figures assume that migration into the area accounts for all new jobs and related population and that the newly created jobs are not taken by existing residents of the area.

[3]Extrapolated from employment data for Colony Development Project. "Draft Environmental Impact Statement on the Proposed Development of Oil Shale Resources by the Colony Development Operation in Colorado," U.S. Department of Interior, 1975.

[4]Derived from assumption that 475 employees are required to operate 2000 Mw powerplant. *Air Quality and Energy Development in the Rocky Mountain West*, p. 34, Los Alamos Scientific Laboratory, September 1977

[5]Calculated from ratio of population to workers of 5:1. "Oil Shale in Colorado 1979," p. 22, Colorado Energy Research Institute, 1979.

[6] Based on assumption of 7,500 tons/man-year average of coal production derived from data in the "Final Environmental Statement on Northwest Colorado Coal," U.S. Department of Interior, 1976.

[7]These coal production figures are from "Interim Updates to 1985 and 1990 Regional Forecasts" by the Leasing Policy Development Office of the U.S. Department of Energy, April 1979. DOE was unable to provide a state-by-state breakdown of how much of these production figures are due to demand for coal for use in synthetic fuel conversion. However, the following tables show DOE's data for national and Western coal demand for use in syntuels.

National

	1985			1990		
	Low	Mid-range	High	Low	Mid-range	High
Coal demand (MMTPY)	11.8	11.8	12.6	26.2	28.0	43.1

Western

1990 Mid-range Medium BTU (MT, WY, ND, SD, UT, CO)	1990 Mid-range High BTU (CO, MT, WY)
6.23	3.02

Table 14

ESTIMATES OF POPULATION GROWTH IN MONTANA RELATED TO COAL MINING, COAL-FIRED POWERPLANTS, AND COAL SYNFUEL PLANTS

	Coal Production (mm T/y)			Cumulative Growth in Primary Workers (Permanent)[1]		Cumulative Growth in Total Population[2]	
	1977	1985	1990	1985	1990	1985	1990
Coal Mining w/o Synfuels[7]	27.0	98.1	121.6	2250[5]	2789[5]	14,850[6]	18,407[6]
Planned Powerplants							
Colstrip Unit 3 (700 Mw; Startup 7/83)				336	336	2668[6]	2668[6]
Colstrip Unit 4 (700 Mw; Startup 5/84)				-	120	-	810
Basin Electric Unit 1 (500 Mw; Startup 1988)[9]				-	83	-	560
Montana Power Co. (350 Mw; Startup 1989)							
Coal Synfuel Plants							
Circle West Project (10-30,000 bbl/d diesel; 17-34,000 bbl/d methanol; 1-3,000 T/d ammonia; assume startup 1990)	-	-	(5.0-13.1)	-	138-328[3]		952-2263[6]
Burlington Northern (100,000 bbl/d of diesel; assume startup 1990)	-	-	(15.3)[3]	-	512[3]	-	3533[6]
Montana Power Co. (assume 250 MMCFD;- assume startup 1990)	-	-	(8.5)[4]	-	741[4]	-	5113[6]
Tenneco[8]- assumed located in North Dakota							
WESCO - assumed located in New Mexico							
Montco (250MMCFD; assume startup 1990)	-	-	(10.3)	-	741[4]	-	5113[6]
Utah International (250MMCFD; assume startup 1990)	-		(8.5)[4]		741[4]	-	5113[6]
Coal Mining for Synfuel Plants	-		39.1-55.7	-	651-791		4297-5221[6]
TOTAL	27.9	98.1	160.7-177.3	2586	6852-7182	17,118	46,566-48,801

[1] This is an estimate of the number of workers directly employed by the new energy facility. It does not include construction workers.

[2] This is an estimate of the total direct and indirect employment and related population increase related to the new energy facility. Note that the figures assume that migration into the area accounts for all new jobs and related population and that the newly created jobs are not taken by existing residents of the area.

[3] Extrapolated from projected production and primary workers required for North Dakota Methanol Consortium plant. "West-Central North Dakota Regional Environmental Impact Study on Energy Development," U S Department of the Interior, 1979

[4] Based on coal input and worker data for Panhandle Eastern Gasification Project. "Proposed Coal Gasification Project," Wyoming Coal Gas Company and Rochelle Coal Company, October 1974.

[5] Based on formula that 43,600 tons are produced per man-year as calculated from production and employment data in the "Final Environmental Statement on Eastern Powder River Coal," U.S. Department of Interior, 1979.

[6] Calculated using multipliers of 6.6 times the number of primary workers for surface mines, 6.75 for powerplants, and 6.9 for gasification plants, *Air Quality and Energy Development in the Rocky Mountain West*, p. 34, Los Alamos Scientific Laboratory, September 1977.

[7] Coal production figures are September 1979 estimates compiled by the Northern Powder River Basin Coal EIS team composed of personnel from the Montana Department of State Lands, the U.S. Geological Survey, and the Deparrment of Interior.

[8] Tenneco has filed a preliminary long range plan with the State of Montana stating that two-thirds of the coal production for the project would be from Montana and one-third from North Dakota, but for the purposes of this analysis, all impacts were assumed to be in North Dakota.

[9] This powerplant may be located in Wyoming or Montana, but for the purposes of this study, it is assumed it will be in Montana.

Table 15

ESTIMATES OF POPULATION GROWTH IN NEW MEXICO RELATED TO COAL AND URANIUM MINING, COAL-FIRED POWERPLANTS, AND COAL SYNFUEL PLANTS

		Coal Production (mm T/y)			Cumulative Growth in Primary Workers (Permanent)[1]		Cumulative Growth in Total Population[2]	
		1977	1985	1990	1985	1990	1985	1990
Coal Mining w/o Synfuels[10]	High	-	47	90	1526[7]	3396[7]	10072[5]	22414[5]
	Medium	11.895	32	54	874[7]	1831[7]	5786[5]	12085[5]
	Low	-	18	18	266[7]	266[7]	1756[5]	1756[5]
Planned Powerplants								
San Juan 4 (472 Mw; Startup 5/82)					113	113	780	780
Escalante Unit 1 (210 Mw; Startup 5/84)				(Units 1 & 2)	50	100	345	690
Escalante Unit 2 (210 Mw; Startup 5/88)					-	113	-	780
New Mexico Station (472 Mw; Startup 5/88)								
Uranium Mining & Milling					8274[4]	9901[4]	54608[5] (5500-17000)	65347[5]
Coal Synfuel Plants								
Wesco (250 MMCFD; assume startup 1985)		-	(9.6)	(9.6)	1100	1100	7590[9]	7590[9]
El Paso (72-288 MMCFD; assume startup 1984)		-	(2.6-10.3)	(2.6-10.3)	246-985[3]	246-985[3]	1723-6891[8]	1723-6891[8]
Coal Mining for Synfuel Plants		-	12.2-19.9	12 2-19.9	525-898[7]	525-898[7]	2069-3537[8]	2069-3537[8]
TOTAL (medium coal projections)		11.895	44.2-51.9	66.2-73.9	10936-12048	13929-15041	72901-79537	91064-97700

[1]This is an estimate of the number of workers directly employed by the new energy facility. It does not include construction workers.

[2]This is an estimate of the total direct and indirect employment and related population increase related to the new energy facility. Note that the figures assume that migration into the area accounts for all new jobs and related population and that the newly created jobs are not taken by existing residents of the area.

[3]Data for 72 MMCFD plant scaled down from data for 288 MMCFD plant.

[4]Calculated using New Mexico Department of Energy and Minerals estimates of uranium production for 1978 of 8560 tons, for 1985 of 19,317 tons and for 1990 of 21,432 tons. Each worker is assumed to produce 1.3 tons/year based on data in *Annual Report to Congress 1978*, Vol. 3, Energy Information Administration, July 1979 and "Statistical Data of the Uranium Industry," U.S. Department of Energy, January 1979.

[5]Multiplier of 6.6 times the number of primary workers used to derive Growth in Total Population. *Air Quality and Energy Development in the Rocky Mountain West*, p. 34, Los Alamos Scientific Laboratory, September 1977.

[6]"Final Environmental Statement on the Star Lake-Bisti Regional Coal," U.S. Department of Interior, 1979.

[7]Extrapolated from data on the WESCO and El Paso mines in the "Final Environmental Statement on the El Paso Coal Gasification Project," U.S. Department of Interior, 1977.

[8]Based on population to worker ratio in "Final Environmental Statement on the El Paso Coal Gasification Project," U.S. Department of Interior, 1977.

[9]Calculated using a multiplier of 6.9 times the number of primary workers for gasification plants *Air Quality and Energy Development in the Rocky Mountain West*, p. 34, Los Alamos Scientific Laboratory, September 1977.

[10]These coal production figures are estimates by the New Mexico Department of Energy and Minerals.

Table 16

ESTIMATES OF POPULATION GROWTH IN NORTH DAKOTA RELATED TO COAL MINING, COAL-FIRED POWERPLANTS, AND COAL SYNFUEL PLANTS

		Coal Production (mm T/y)			Cumulative Growth in Primary Workers (Permanent)[1]		Cumulative Growth in Total Population[2]	
		1977	1985	1990	1985	1990	1985	1990
Coal Mining w/o Synfuels[4]	High	-	26.7	31.1	606	790	4000	5214
	Medium	12.2	26.7	31.1	606	790	4000	5214
	Low	-	24.0	31.1	493	790	3254	5214
Planned Powerplants								
Coyote 1 (390 Mw; Startup 5/81)					70	70	473	473
Antelope Valley 1 (416 Mw; Startup 11/81)					160	160	1080	1080
Antelope Valley 2 (416 Mw; Startup 11/83)								
Coal Synfuel Plants								
ANG (250 MMCFD; Startup 1983)		-	(9.4)	(9.4)	414	640	2857	4416
NGPL (People's) (250 MMCFD; Startup 1989)		-	-	(13.9)	-	612	-	4223
Methanol Consortium (164,000 b/d; assume startup 1990)		-	-	(25)	-	840	-	5796
Tenneco (250 MMCFD; assume startup 1990)		-	-	(14.0)	-	616	-	4250
Coal Mining for Synfuel Plants		-	9.4	62.3	47	2600[3]	310	17160
TOTAL (medium coal projection)		12.2	36.1	93.4	1297	6328	8720	42612

[1]This is an estimate of the number of workers directly employed by the new energy facility. It does not include construction workers.

[2]This is an estimate of the total direct and indirect employment and related population increase related to the new energy facility. Note that the figures assume that migration into the area accounts for all new jobs and related population and that the newly created jobs are not taken by existing residents of the area. Calculated using multipliers of 6.6 times the number of primary workers for surface mines, 6.75 for powerplants, and 6.9 for gasification plants. *Air Quality and Energy Development in the Rocky Mountain West*, p. 34 Los Alamos Scientific Laboratory, September 1977.

[3]Based on assumption of 23,992 tons/man-years calculated from tonnage/worker from coal mines supplying ANG and NGPL projects. "Final West-Central North Dakota Regional Environmental Impact Study on Energy Development," U.S. Department of Interior, 1979.

[4]These coal production figures are from "Interim Updates to 1985 and 1990 Regional Forecasts" by the Leasing Policy Development Office of the U.S. Department of Energy, April 1979. DOE was unable to provide a state-by-state breakdown of how much of these production figures are due to demand for coal for use in synthetic fuel conversion. However, the following table shows DOE's data for national and western coal demand for use in synfuels. The large majority of it is attributable to Eastern production.

	National						Western	
	1985			1990				
	Low	Mid-range	High	Low	Mid-range	High	1990 Mid-range Medium BTU (MT, WY, ND, SD, UT, CO)	1990 Mid-range High BTU (CO. MT, WY)
Coal demand (MMTPY)	11.8	11.8	12.6	26.2	28.0	43.1	6.23	3.02

Table 18

ESTIMATES OF POPULATION GROWTH IN WYOMING RELATED TO COAL AND URANIUM MINING, COAL-FIRED POWERPLANTS, AND COAL SYNFUEL PLANTS

	Coal Production (mm T/Y)			Cumulative Growth in Permanent Primary Workers From 1977[1]		Cumulative Growth In Total Population for 1977[2]	
	1977	1985	1990	1985	1990	1985	1990
Coal Mining w/o Synfuels[9]							
High	-	123.5	240.1	1808[5]	4484[5]	11933[7]	29594[7]
Medium	44.5	119.4	223.0	1832[5]	4091[5]	12091[7]	27001[7]
Low	-	117.3	179.4	1668[5]	3092[5]	11009[7]	20407[7]
Planned Powerplants							
Osage 1 (100 Mw; Startup 6/85)				24	24	162[4]	162[4]
Laramie River Station 3 (500 Mw; Startup 4/82)				120	120	810[4]	810[4]
Basin Electric Unit 1 (500 Mw; Startup 1988)				Assumed to be located in Montana.			
Uranium Mining & Milling				6153[6]	8231[6]	40610[7]	54325[7]
				(2850)[8]	(3015)[8]	(18810)[7]	(19899)[7]
Panhandle Eastern (270 MMCFD; assume startup 1986)			(9.2)	300	800	2070[4]	5520[4]
Carter Oil (assume 250 MMCFD; assume startup 1990)			(8.5)[3]	-	741[3]	-	5113[4]
Texaco (assume 250 MMCFD; assume startup 1990)			(8.5)[3]	-	741[3]	-	5113[4]
Mobil (assume 250 MMCFD; assume startup 1990)			(8.5)[3]	-	741[3]	-	5113[4]
Coal Mining for Synfuel Plants			34.7	100	1099[3]	660[4]	7253[4]
TOTAL (medium coal projections)	44.5	119.4	257.7	8409	16588	56403	110410
				(5226)	(11372)	(34603)	(75984)

[1]This is an estimate of the number of workers directly employed by the new energy facility. It does not include construction workers.

[2]This is an estimate of the total direct and indirect employment and related population increase related to the new energy facility. Note that the figures assume that migration into the area accounts for all new jobs and related population and that the newly created jobs are not taken by existing residents of the area.

[3]Extrapolated from data on Panhandle Eastern Project in "Proposed Coal Gasification Project," by Wyoming Coal Gas Company and Rochelle Coal Company, October 1974.

[4]Calculated using multiplier in *Air Quality and Energy Development in the Rocky Mountain West*, p. 34, Los Alamos Scientific Laboratory, September 1977.

[5]Based on formula that 43,600 tons are produced per man-year as calculated from production and employment data in the "Final Environmental Statement on Eastern Powder River Coal," U.S Department of Interior, 1979.

[6]Based on estimates of 8,000 t/yr increase in production by 1985 and 10,700 t/yr by 1990 from "Wyoming's Uranium Industry: Status, Impacts and Trends" prepared for Mineral Division of the Wyoming Department of Economic Planning and Development, by Quality Development Associates, September 3, 1978. Assumes 1.3 tons/year/worker from data in "Statistical Data of the Uranium Industry," U.S. Department of Energy, January 1979

[7]Multiplier of 6.6 times the number of primary workers used to derive Growth in Total Population. *Air Quality and Energy Development in the Rocky Mountain West*, p. 34, Los Alamos Scientific Laboratory, September 1977.

[8]"Final Environmental Statement on Eastern Powder River Coal," U.S. Department of Interior, 1979.

[9]These coal production figures are from "Interim Updates to 1985 and 1990 Regional Forecasts" by the Leasing Policy Department Office of the U.S. Department of Energy, April 1979. DOE was unable to provide a regional or state-by-state breakdown of how much of these production figures are due to demand for coal for use in synthetic fuel conversion. However, the following table shows DOE's data for national and western coal demand for use in synfuels. The large majority of it is attributable to Eastern production

	National						Western	
	1985			1990			1990 Mid-range Medium BTU (MT, WY, ND, SD, UT, CO)	1990 Mid-range High BTU (CO, MT, WY)
	Low	Mid-range	High	Low	Mid-range	High		
Coal demand (MMTPY)	11.8	11.8	12.6	26.2	28.0	43.1	6.23	3.02

TABLE 17

ESTIMATES OF POPULATION GROWTH IN UTAH, RELATED TO COAL MINING, COAL-FIRED POWERPLANTS, AND COAL SYNFUEL PLANTS

		Coal Production (mm T/y)			Cumulative Growth in Primary Workers (Permanent)[1]		Cumulative Growth in Total Population[2]	
		1977	1985	1990	1985	1990	1985	1990
Coal Mining w/o Synfuels[8]	High	-	10.1	23.0	250[5]	3837[5]	1650[6]	25324[6]
	Medium	9.2	10.4	20.9	334[5]	3253[5]	2204[6]	14546[6]
	Low	-	10.1	21.3	250[5]	3364[5]	1650[6]	10890[6]
Planned Powerplants								
Hunter Unit 3 (400 Mw; Startup 6/83)				(Units 3 & 4)	192	192	1296[6]	1296[6]
Hunter Unit 4 (400 Mw; Startup 6/85)								
Intermountain 1 (750 Mw; Startup 1/86)					-	180	-	1215[6]
Intermountain 2 (750 Mw; Startup 1/87)					-	180	-	1215[6]
Intermountain 3 (750 Mw; Startup 1/88)					-	180	-	1215[6]
Intermountain 4 (750 Mw; Startup 1/89)					-	180	-	1215[6]
Warner Valley 1 (250 Mw; Startup 6/84)				(Units 1 & 2)	120	120	810[6]	810[6]
Warner Valley 2 (250 Mw; Startup 6/85)					-	-	-	-
Deseret (400 Mw; Startup 1986)					-	96		6484
Coal Synfuel Plants								
Mountain Fuel Supply Co. (275 MMCFD; Startup 1990)		-		(6.6)	-	660[3]	-	4554[6]
Coal Mining for Synfuel Plants		-	-	6.6	-	1835[5]	-	11010
TOTAL (medium coal projections)		9.2	10.4	27.5	646	6756	4310	43560

ESTIMATES OF POPULATION GROWTH IN UTAH RELATED TO OIL SHALE PLANTS

Oil Shale Plants								
TOSCO Sand Wash Project (50,000 b/d; assume Startup 1990)					-	1106[4]	-	6636[7]
White River Project (100,000 b/d; assume Startup 1990)					-	2212[4]	-	13272[7]
Naval Oil Shale Reserves - Initial study								
				TOTAL	-	3318	-	19908
TOTAL FOR COAL-RELATED AND OIL SHALE-RELATED POPULATION GROWTH					646	10194	4110	63460

[1]This is an estimate of the number of workers directly employed by the new energy facility. It does not include construction workers.

[2]This is an estimate of the total direct and indirect employment and related population increase related to the new energy facility. Note that the figures assume that migration into the area accounts for all new jobs and related population and that the newly created jobs are not taken by existing residents of the area.

[3]Derived from assumption that 1200 employees are required to operate a 500 MMCFD gasification plant. *Air Quality and Energy Development in the Rocky Mountain West*, p. 34, Los Alamos Scientific Laboratory, September 1977.

[4]Extrapolated from employee data from Tosco's Colony Development Project. "Draft Environmental Impact Statement on the Proposed Development of Oil Shale Resources by the Colony Development Operation in Colorado," U.S. Department of Interior, 1975

[5]Based on assumption of 3,597 tons/man-year average of coal production derived from data in the "Final Environmental Statement on the Development of Coal Resources in Central Utah," U.S. Department of Interior, 1979 and the "Final Environmental Statement on the Development of Coal Resources in Southern Utah," U.S Department of Interior, 1979.

[6]Based on estimates of 8,000 t/yr increase in production by 1985 and 10,700 t/yr by 1990 from "Wyoming's Uranium Industry: Status, Impacts and Trends," prepared for Mineral Division of the Wyoming Department of Economic Planning and Development, by Quality Development Associates, September 3, 1978. Assumes 1.3 tons/year/worker from data in "Statistical Data of the Uranium Industry," U.S. Department of Energy, January 1979.

[7]Multiplier of 6.6 times the number of primary workers used to derive Growth in Total Population. *Air Quality and Energy Development in the Rocky Mountain West*, p. 34, Los Alamos Scientific Laboratory, September 1977.

Ibid.

[8]"Final Environmental Statement on Eastern Power River Coal," U S. Department of Interior, 1979.

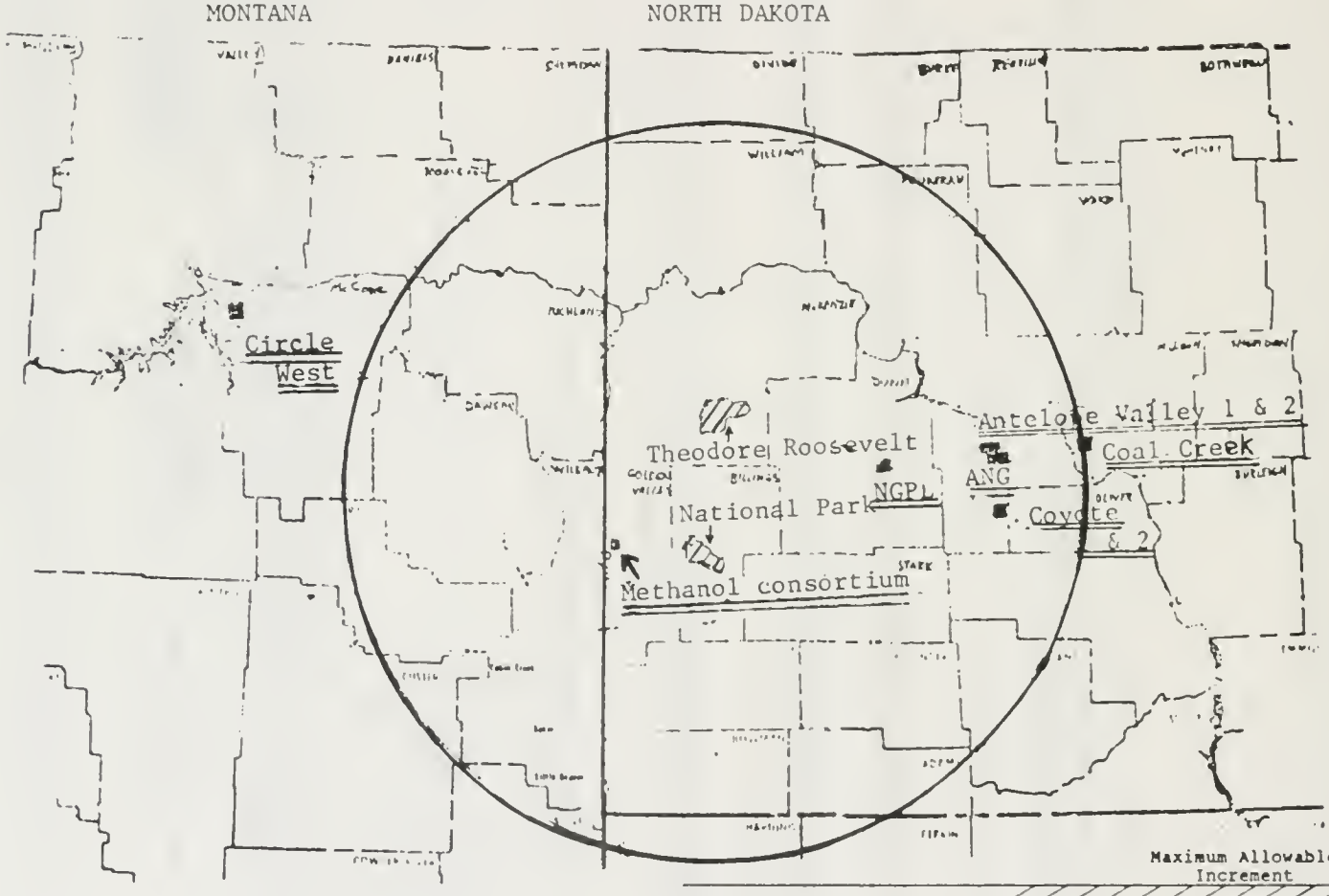
[9]These coal production figures are from "Interim Updates to 1985 and 1990 Regional Forecasts," by the Leasing Policy Development Office of the U.S. Department of Energy, April 1979. DOE was unable to provide a regional or state-by-state breakdown of how much of these production figures are due to demand for coal for use in synthetic fuel conversion. However, the following table shows DOE's data for national and western coal demand for use in synfuels. The large majority of it is attributable to Eastern production.

	1985			1990			Western	
	Low	Mid-range	High	Low	Mid-range	High	1990 Mid-range Medium BTU (MT, WY, ND, SD, UT, CO)	1990 Mid-range High BTU (CO, MT, WY)
Coal demand (MMTPY)	11.8	11.8	12.6	26.2	28.0	43.1	6 23	3 02

Environmental Impacts

Air Quality

Current air quality standards are likely to be a limiting factor for a number of the presently envisioned coal synfuels plants. For example, in North Dakota the available Class I increment for Theodore Roosevelt National Park has been taken by proposed powerplants and the ANG gasification plant. The NGPL gasification plant cannot receive a PSD permit under current conditions. Additionally, the Class I area could prevent construction of the Tenneco gasification plant, the location of the 164,000 b/d coal-to-methanol facility and possibly the Circle West project. Any definitive analysis of the impact of the Roosevelt National Park Class I area would have to await site specific air quality modeling. Additionally, there may be some offset possibilities whereby existing sources could be cleaned up to allow the construction of a new source. The following map and table show the amount of the Class I increment taken by the various emission sources in the area.



INFLUENCE OF SULFUR DIOXIDE EMISSIONS FROM PERMITTED SOURCES UPON PREVENTION OF SIGNIFICANT DETERIORATION CLASS I ALLOWABLE INCREMENTS IN THE THEODORE ROOSEVELT NATIONAL PARK (24-HOUR SULFUR OIOXIDE LIMITATION)

	Maximum Allowable Increment
Antelope Valley #1 & #2	1.3 $\mu g/m^3$
American Natural Gas	1.6 $\mu g/m^3$
Coyote #1	0.7 $\mu g/m^3$
Coal Creek	1.4 $\mu g/m^3$

5 Micrograms Per Cubic Meter

SOURCE: North Dakota State Department of Health 1978

NOTE: $\mu g/m^3$ - micrograms per cubic meter

In Montana there may be air quality problems in siting a gasification facility in the Colstrip area because Colstrip powerplants 3 and 4 may, under certain siting and meteorological conditions, use all the available increment related to the Class I Northern Cheyenne Indian Reservation. There may also be non-attainment air quality problems in the Four Corners area.

Currently, the air in the western oil shale region is relatively clean. The mining and retorting processes do produce emissions which require oil shale plants to meet EPA air quality standards. There are several indications that at least some proposed plants will be able to comply with clean air requirements. The EPA has awarded several PSD permits to oil shale projects. A conditional PSD permit was issued to the C-b Shale Oil Venture in December of 1977, and in July of this year, EPA issued PSD permits to the Colony Development Operation and the Union Long Ridge Project.

A major issue in 1978 was the impact of the proposed ozone National Ambient Air Quality Standard which was exceeded by the natural background level in the oil shale region. EPA adopted a standard of 235 micrograms per cubic meter which will permit at least some oil shale development. For example, the present level of ozone at the Superior Oil Co. site is 220 micrograms per cubic meter, and the project is expected to add another 15 micrograms per cubic meter to this quantity.[1]

As with coal synfuels projects, each project will have to be evaluated for its compliance with air quality standards. In general, it is safe to say that in situ projects emit less, and thus will have a greater possibility of complying with state and federal regulations.[2]

[1]Draft Environmental Statement on the Proposed Superior Oil Company Land Exchange and Oil Shale Resource Development, p. 76 (Department of Interior, 1979)

[2]Oil Shale and the Environment (Environmental Protection Agency, October 1977)

Water Availability

A number of studies[1] conclude that in the aggregate there is sufficient water in the West to support a synthetic fuels industry of a size equal to the President's goal. However, the general availability of water does not guarantee that it will be in the right location, or that water can be secured by all synfuel developers, or that water should be used for synfuels at the possible expense of other uses including agriculture or coal-fired powerplants to meet local needs. Specific problems have already arisen. For example, the Circle West project is having difficulty securing its water needs from the Fort Peck Reservoir in Montana.

However, in general water availability should not present a major obstacle to a synfuels program to meet the President's goal.

For illustrative purposes, the following tables show the amount of water to be used by various synfuel proposals and an estimate of the aggregate demand for water in the West under the President's program.

Table 19

Water Consumption from Selected Presently Envisioned Projects

Project	Type	Plant Capacity	Water Use in Acre-feet/year
Rio Blanco	oil shale	76,000 b/d	13,000
Superior	oil shale	13,000 b/d	3,600
C-b	oil shale	57,000 b/d	4,538
Colony	oil shale	47,000 b/d	7,200
Circle West	diesel	10-30,000 b/d	5-15,000
		1-3,000 t/day of ammonia	3-9,000
	methanol	17-34,000 bbl/d	4-8,000
El Paso	gasification	288 mmcfd	15,000
WESCO	gasification	250 mmcfd	8,371
NGPL	gasification	250 mmcfd	11,750
ANG	gasification	275 mmcfd	17,000
Mountain Fuel Supply	gasification	275 mmcfd	10,000
Panhandle Eastern	gasification	270 mmcfd	4,750-7,900

[1] "Water Availability Assessment for Coal Technology Requirements," Upper Missouri River Basin Commission, December 1978; "Water Availability Assessment for Oil Shale and Coal Technology," Upper Colorado River Basin Commission, 1979 (draft); "Synthetic Liquid Fuels Development Assessment of Critical Factors," Energy Research and Development Agency, 1976; "Upper Colorado River Region Water Assessment," Colorado Department of Natural Resources, September 1979; "Overview of Synthetic Fuels Potential to 1990" prepared for Senate Budget Committee, Cameron Engineers, August 1979; Gold and Probstein, *Water in Synthetic Fuel Production*, MIT Press, 1978.

Table 20

Rough Estimate of Total Water Consumption from Plants Needed to Meet President's Synfuels Goals for West

	West's Share of President's Goal [1] (barrel equivalents/d)	Estimated Water Consumption per Full Scale Plant [2] (af/yr)	Total Water Consumption (af/yr)
Oil Shale	400,000 b/d (5 full-scale 50,000 b/d plants)	7,500	37,500
High-Btu Coal Gasification	163,000-550,000 b/d (3.75 to 12.75 full-scale 250 mmcfd plants)	11,000	41,000-140,000
Coal Liquefaction (methanol)	100,000-363,000 b/d (1 to 3.6 full scale b/d plants)	10-20,000	10,000-72,000

[1] from Table 7
[2] from "Environmental Analysis of Synthetic Liquid Fuels," U.S. Department of Energy, Office of Technology Impacts, July 1979, and average from Table 19.

For comparison purposes, the following table has been developed to show the amount of water used per ton of coal consumed by various proposed energy developments in the West.

Table 21

Comparison of Water Consumption by Various Coal Projects

Project	Water Used (af/yr)	Coal Consumed (million tons/yr)	Water Consumption in af/yr per Million Tons of Coal Used
ANG gasification	17,000	9.4	1809
Panhandle Eastern gasification	4,750-7,900	9.2	516-859
El Paso gasification	15,000		
Circle West liquefaction	9-23,000	3.9-9.8	2308-2347
San Juan powerplant	20,200	5.1	3961
Coyote 1	11,000	2.2	5000
ETSI coal slurry pipeline	15,000	25.0	600

Water Quality Impacts of Oil Shale and Coal Synfuels Projects[1]

In general, coal synfuels plants and above-ground retorting oil shale plants plan for zero discharges into water supplies and will comply with state and federal effluent and point source discharge standards. However, in situ oil shale processes or disposal sites may lead to leaching which violates underground injection guidelines and sole source aquifer regulations of the Safe Drinking Water Act. Some disposal methods being considered for in-situ processing are to channel the wastewater into the piles of retorted shale left in the ground, to pump it into aquifers that are already heavily salt loaded, or to let it collect in large evaporation ponds. However, none of these methods is totally satisfactory.

[1]"Environmental Analysis of Synthetic Liquid Fuels," U.S. Department of Energy, 1979; "Oil Shale and the Environment," U.S. Environmental Protection Agency, October 1977.

Additional Environmental Issues

In addition to the current air and water quality regulations which are expected to have an impact on the location and level of synfuels production, there are other environmental regulations yet to be developed which may have a major effect on synfuels projects. For example, the EPA may in the future determine that solid wastes from oil shale and coal liquefaction are hazardous under the Resource Conservation and Recovery Act, which would greatly increase the cost of waste disposal. Another possibility is that the Toxic Substances Control Act may be used to control the transportation of synfuels which are a hazard to health or welfare. Other areas of concern are surface mining regulations, visibility regulations under the Clean Air Act Amendments of 1977, and conservation and preservation laws, such as the Endangered Species Act.

A Workable Synfuels Program:

A Western States' Perspective

A Workable Synfuels Program: A Western States' Perspective

PHASED DEVELOPMENT

The Western states recognize the compelling national need to develop oil shale and synthetic fuels from coal, tar sands, and biomass. It is clear, though, that the Western region will bear the major portion of the burden from the development of these resources. While the states are willing to accept their responsibility at this critical point in the nation's history, the state governments in the West have a duty to the citizens who will be most affected by the rapid development of their natural resources.

As earlier sections of this report have indicated, synfuel technologies have not developed to the commercial stage with the one exception of the coal liquefaction (SASOL/Fischer-Tropsch) operation in South Africa. The SASOL project is presently being modified to increase production to 30,000 tons per day by 1981. For the most part then, synthetic fuel development is presently in the planning, demonstration, or pilot plant stage. As well, even the most optimistic projections from knowledgable sources indicate that technological uncertainties may be the most significant hindrance to rapid synfuel development.

The economics of different synfuel processes also present significant limitations to a "crash program" of development. A recent report prepared by Cameron Engineers, for example, indicates that in 1979 dollars, the selling price for shale oil products ranges from a low of $15 to $26 per barrel. On the other hand, the selling prices for coal liquefaction and coal gasification processes jump to a range of $30 to $50 per barrel of oil equivalent.

Given the limited "state of the art" technical processes as well as the current economics of particularly coal synfuels, Western states are extremely wary of so-called "fast track" legislative proposals which would circumvent existing state and local regulation for the purpose of stimulating such development. As well, for those technical processes which may now appear to be susceptible of commercial operation from an economic standpoint (i.e., certain oil shale processes and the SASOL coal synfuel technology) each state which will be impacted by these operations expresses a different policy with regard to the timing, number and location of full scale plants.

Colorado, for example, contains over 80% of the nation's high-grade oil shale reserves. Nevertheless, within the next ten to twenty years, shale oil production will play a limited, although important, role in meeting the country's petroleum needs. Colorado feels it is imperative to launch this industry in a positive fashion that will insure its long-term viability. As the state has consistently proposed, this can best be done with a phased development program as opposed to a crash program.

With regard to oil shale development, Colorado has recently ennunciated a specific phased development policy. In essence, due to the unproven nature of a variety of oil shale technologies (to date only a variety of prototype plants producing 100 to 1,000 barrels of kerogen per day have been demonstrated), Colorado feels that a scale-up to minimal commercial scale plants (i.e., 5,000 to 12,000 barrels per day) will be ten to fifty times the size of existing prototypes. There is an important learning curve that will develop as retorts are escalated to commercial size. As such, then, basic commercial sized retorts should first be constructed,

tested, and modified. Then, operators should be permitted to add more retorts in a deliberately-phased manner. Attainment of full-scale commercial-sized plants will most likely be accomplished by adding commercial-sized retorts of about 5,000 to 12,000 barrels per day each, one-by-one and side-by-side, until production capacity of a single plant reaches 50,000 barrels per day.

While other states are not so exact in their definition of what "phased development" means, socio-economic impacts from these operations appear to be the major concern of the state sovereigns. The states anticipate enormous impacts during construction and operation of major synfuel plants combined with the inability of communities to handle the impacts: lack of front-end money in meeting community needs before the tax base is in place; rapidly increasing demand for community services; immediate housing shortage as workers arrive to build the plants or mines; and increases in social problems associated with unplanned, explosive growth.

Further, these impacts will not be limited to communities; farmers, ranchers and others will also be affected as additional people put pressure on agricultural land and water above the direct needs of the energy industry. As well, highway construction will cost several hundred million dollars which are not available from state and local treasuries. At this time, no comprehensive programs exist at the federal, state, or local level to equip Western state citizens to deal with such rapid expansion.

Therefore, for example, Utah has recently stated its major state policy concern should a synfuels industry take shape in the West. Pursuit of a phased approach is a direct function of synthetic fuel economic and technological constraints as well as the requirements for proper management of community growth to absorb energy development impacts. The state stresses that synfuel development should proceed within the context of state growth management plans. Development based on technological issues alone is not flexible enough to allow government at all levels to deal with rapid changes in populations and lifestyles.

Finally, other states in the Western region agree with the general statement of the benefits of a phased development approach which will:

- Maximize the number of alternative technologies that may be developed;
- Reduce errors during scale-up which will ultimately lead to greater production levels;
- Control and spread population growth thus softening local boom town effects while maintaining local autonomy;
- Provide equal opportunity for smaller firms with innovative processes to compete technologically; and
- Result in more efficient resource use through demonstrations of different technologies.

Regardless of the particular policy of any state, the point which must be emphasized is the inherent interest of each state in the development of the natural resources which lie within state boundaries. Existing state environmental and other regulatory limitations should not now present major roadblocks to the development of a synfuel industry and each state must be permitted to continue the application of such regulation. Because states have substantial experience with the implications of proper and improper phasing of development, it is important to the success of the synfuel program that the federal government look to the states to guide siting and development.

IMPACT AID

Implementation of a massive synthetic fuels program will necessarily result in a significant influx of a work force to run the synfuels plants. Senator Hart, the leading advocate of impact aid legislation, cites DOE estimates that an average 100,000 bbl/d facility will draw 20,000 new people to the site. Therefore, 20 such facilities, bringing in a total of 400,000 people, would be needed to reach President Carter's goal of a 2 mmb/d synfuels industry by 1990.

This influx will obviously place great demands on the local communities to provide adequate and necessary facilities. Hart cites DOE estimates that "development costs of the facilities and services minimally necessary for each new resident associated with energy development is $7,000." This would total $140 million per 100,000 bbl/d facility or $2.8 billion for a 2 mmb/d synfuels industry.

The impact of this large work force and consequent strain on a community's facilities and funding capabilities is amplified by the fact that most of it will occur in rural areas. According to Senator Hart, "DOE has identified 41 counties in the country which could support a coal-based synthetic fuel plant; 31 of these have populations of 50,000 or less. Of the 27 western counties in this group, 26 have populations under 20,000." To address this problem, Senator Hart has introduced an impact aid bill, S 971.

The Hart bill, which is supported by Senators Ford, Randolph, Baucus, Burdick, Domenici, Gravel and Melcher, is designed to expand and extend the existing energy impact aid program established by section 601 of the Industrial and Powerplant Fuel Use Act of 1978 (FUA). Section 601 of FUA treats only areas impacted by increased coal and uranium production, while the Hart amendment/bill would cover areas affected by any "major energy development," thus expanding its applicability to include synfuels development.

Like Section 601, the Hart legislation provides planning grants and land acquisition and development grants. However, the Hart bill also includes "general mitigation assistance" which provides grants, loans, and loan guarantees to states and Indian tribes to fund public facilities and services "identified in an approved comprehensive investment strategy." States and tribes may spend the funds directly or redistribute them to local governments as grants (under limited circumstances), loans, loan guarantees, interest payments on loans, "or other appropriate means." The Hart legislation carries a budget authorization of $60 million for FY-79, $150 million for FY-80, and $400 million for each of the fiscal years 1981 through 1985. Section 601 of FUA authorizes expenditures of $60 million for FY-79 and $120 million for FY-80.

An alternative to the Hart bill is an impact aid proposal hammered out by the National Governors' Association (NGA) in an August 30 meeting. NGA has been a long-time supporter of energy impact aid legislation, but has worked out a somewhat different approach than that of S 971. Rather than amending the entire section 601 of FUA, as the Hart bill would do, NGA prefers the introduction of a much smaller bill that would amend only specific parts of section 601.

Besides employing different means (i.e., a shorter, hopefully less controversial bill), NGA also is seeking somewhat different ends than S 971. Specifically, NGA would establish a clear grant program for public facilities construction, rather than the loan, loan guarantee and limited grant program called for in S 971. The definition of public facilities would be limited to the basics, including water, sewer, and highway access, leaving such other problems as railroad/highway grade crossings to separate legislation. The NGA would also more narrowly define the impact aid program to energy-producing facilities, eliminating such energy-consuming facilities as electric powerplants, which are included in S 971. This limitation would obviously still include synfuels production facilities.

The NGA has apparently not settled on the amount of funding that would accompany such legislation. However, it is urging President Carter to transfer $150 million originally requested for EDA to DOE for impact aid.

The NGA may seek to persuade Senator Hart to scrap his S 971 and reintroduce a new impact aid bill fashioned after its proposals. S 971 has already experienced one setback, with the report that the managers of S 1308, Senator Jackson's comprehensive energy bill, do not want any extraneous amendments to it, and so will not incorporate S 971 into it, as had earlier been proposed.

EXPEDITED REVIEW OF PROJECTS

Permits & Other Mandatory Requirements For Synfuels Development

A variety of federal, state, and local permit, license and other mandatory requirements must be met before oil shale and coal-related synthetic fuels can be developed. This section of the report summarizes these various requirements.

Several federal permitting and other regulatory requirements have been delegated to individual states pursuant to federal statute. These programs will be noted in the following lists.

I. Federal Permits and Other Requirements

A. Mineral Leases or Sales - federal lands and minerals are subject to stringent regulations for development under lease or sale from federal agencies. The Department of Interior is primarily responsible for such regulations although other agencies including the Department of Energy have developed regulations affecting development as well.

B. Exploration and Mining Plans - coal and oil shale developments must comply with detailed exploration and mining plans approved by federal agencies before land areas are disturbed. These include requirements of various agencies of the Department of Interior such as the Bureau of Land Management, Geologic Survey, and the Office of Surface Mining Reclamation and Enforcement.

C. Detailed Development Plans - oil shale developments are subject to preparation of detailed development plans under the terms of the various federal oil shale leases.

D. Public Lands Rights of Way - rights of way may be granted by the Department of Interior (Bureau of Land Management) and the Department of Agriculture (Forest Service) over public BLM and forest lands.

E. Clean Air - the Clean Air Act established a program for the prevention of significant deterioration (PSD) of air quality in areas with air quality cleaner than the national ambient air standards. States must prepare revisions to the state implementation plans (SIP's) outlining how state programs will deal with clean air areas before program authority will be delegated to the states. EPA now issues PSD permits.

F. Clean Water - the Clean Water Act authorizes EPA or the state to issue National Pollutant Discharge Elimination Permits (NPDES) which regulate the discharge of pollutants into a waterway. Permits are issued for up to five years. Colorado has been delegated the NPDES program.

G. Environmental Impact Statements - EIS's must be prepared for each "major federal action significantly affecting the quality of the human environment." EIS's will be prepared for such federal actions as: access permits across federal lands; lease sales of federal lands and minerals; a variety of other federal licenses and permits which will be issued to particular projects. Certain permitting actions have been exempted from EIS requirements.

H. Environmental Data and Monitoring - baseline environmental data must be prepared for a variety of federal regulatory requirements including Clean Air and Clean Water restrictions, specific parts of oil shale lease provisions, and preparation of EIS's.

I. Underground Injection - states will ultimately have the responsibility to establish programs to control underground injections of substances that may affect water supplies. These well operations permits will be issued by the states that elect to undertake the program.

J. Toxic Substances Control - a list of chemical substances has been prepared which are being produced in the U.S. and sold in commerce. EPA's list includes, for example, shale oil and/or its refined products. EPA may prohibit or limit the manufacturing, processing, distribution, or use in commerce of substances deemed risks to the environment or the public's health. No permits are required at this time.

K. Resource Conservation and Recovery Requirements - new regulations will be issued sometime later this year or perhaps in early 1980 requiring permits for the treatment, storage, or disposal of hazardous waste. Permits will be issued by EPA or a state under an acceptable state program.

L. River and Stream Crossing Permits - the Army Corps of Engineers issues permits for any work which may disturb the water including bridge construction.

M. Tower and Tall Structure Erection - the Federal Aviation Administration (FAA) must approve the construction, alteration, and lighting or marking of certain tall structures.

N. Oil Spill Prevention/Control - oil storage or production in excess of 660 gallons which has the potential for spillage into surface waterways is regulated. Control and countermeasure plans must be prepared by the oil producer or storer and kept on file at the facility.

O. Reports on Wells on Federal Lands - each change of work on a well is required to be reported to the Geologic Survey in the Department of Interior.

P. Major Fuel Burning Installation Approval - a facility that will be burning over 100 million Btu's per hour must file a report with the U.S. Department of Energy.

Q. Historic and Archeological Information - the Secretary of the Department of Interior must approve projects that may cause irreparable harm to areas of significant scientific, pre-historic, historic or archeologic value.

R. Mine Safety and Health - mine operators are now required to provide health and safety training programs for miners.

S. Occupational Safety and Health Requirements - the Occupational Safety and Health Administration has delegated programs to the states of Colorado, Utah, and Wyoming for health and safety related regulation of mining and other development operations.

II. State Permits and Other Requirements

A. Prospecting, Exploration, and Mining Permits - certain state permits are triggered as a function of the size of operations. For example, Colorado requires different permits for operations which remove less than 70,000 tons of material per year as contrasted with activities which remove more than 70,000 tons per year. Both Wyoming and Utah, for example, have exploration permit requirements as well as mining and reclamation requirements that mandate submission of detailed mining and reclamation plans.

B. Clean Air - all states require a variety of air pollution-related permits and notices such as: notices of intent to construct facilities which will emit air pollutants; facility construction permits; air emission permits; fugitive dust permits; and open burning permits.

C. Clean Water and Well Permit Requirements - all states have permit programs for pollutant discharges into surface waterways. As well most states have some type of well drilling permit system for appropriation and use of underground water supplies. The greatest variations among the states comes with regard to discharges of pollutants into or protection of underground water from surface and in situ mining operations. Wyoming, for example, is one of the few states which regulates the in situ mining discharges directly.

D. Solid and Hazardous Wastes - construction and maintenance of solid waste and hazardous waste disposal sites falls under a permit system in the states.

E. Explosives - state permits are generally required for the manufacture, transportation, storage, sale, and use of explosives.

F. Siting Permits - many states require at a minimum that major facilities, such as powerplants, synthetic fuels plants, or other industrial plants, furnish extensive information and obtain a state permit before constructing. The criteria for consideration in some cases include environmental. Montana's siting law goes further in requiring certain utilities to submit long-range plans for approval.

G. Miscellaneous Requirements - state mineral leases and sales are regulated; oil and gas storage permits (CO); flammable liquids storage (CO); boiler inspection permits (CO; UT); escape and evacuation plans must be prepared (UT).

III. County Permits and Other Requirements

A. Zoning Variances and Re-zoning - most mining operations will take place subject to specific zoning requirements which permit activities such as explosives manufacture, storage and use as well as storage and use of flammable liquids and poisonous or toxic materials, and other activities which are not compatible with residential or other land uses.

B. Conditional and Special Use Permits - local units of government may also require permits for mining and prospecting which will ensure protection of water resources and prevent permanent damage to land areas.

C. Building and Construction Permits - these may be required for a variety of facility construction such as offices, storage sheds, maintenance facilities, etc.

D. Solid Waste and Sewage Disposal - additional requirements may be placed on state and federal solid waste and sewage treatment permits.

E. Right of Way Approval - local approval may be required for pipelines and other right of way obligations.

Energy Mobilization Board Proposals

Beginning with the cancellation of the SOHIO West Coast-to-Inland Alaskan oil pipeline, Congress began proposing a multitude of "fast-track" bills to speed the development of energy projects. President Carter also jumped on the bandwagon with his proposal for an Energy Mobilization Board. On October 4 the Senate passed S 1308, creating an Energy Mobilization Board to speed non-nuclear energy projects. The House is expected to pass a similar bill. Following is a description of the Senate bill and the House proposals under consideration.

S 1308

Choice of Projects: The EMB is required to designate, if requested, any oil- or natural gas-fired electric powerplant as a priority energy project if it is being converted to use coal or a coal-derived fuel. The EMB must also designate, if requested, any small hydroelectric facility as a priority energy project. In designating any other priority energy project, the EMB must find it "directly or indirectly will materially reduce the United States dependence on insecure foreign oil or petroleum products...."

Who Sets Deadlines: After consulting with the appropriate federal agencies and state governor(s), the EMB sets all deadlines in a Project Decision Schedule. No Project Decision Schedule may take up more than two years, unless the EMB determines that additional time is necessary.

Actions Taken if Deadlines Not Met: The EMB may make any federal, state or local agency's decision or action when that agency has failed to do so within the Project Decision Schedule time frame. In taking such action, the EMB must "apply the decision criteria in the Federal, State, or local law that would have applied" if the agency itself had made the decision. The EMB may also bring an enforcement action in the U. S. district court if any federal, state or local agency has failed, "or is reasonably likely to fail" to meet the Project Decision Schedule.

Authority Over Federal, State & Local Laws: The EMB may, by majority vote and presidential concurrence, temporarily waive any federal, state or local law, regulation, or requirement enacted or promulgated after construction has begun on a priority energy project. The waiver will apply for only such time as is necessary to comply without substantially delaying the completion or start of operations of the affected energy facility and will be granted only when:

- the EMB determines it is "necessary to avoid a significant delay in the completion and commencement of operation of the facility."

- EPA has not disapproved the waiver, subject to presidential concurrence, on grounds that it could "reasonably be expected to result in the ... release of any toxic or hazardous ... or any other pollutant which may reasonably be ... a substantial endangerment to the public health ..."

- DOI has not disapproved the waiver, subject to presidential concurrence, on grounds that it could "reasonably be expected to result in any irretrievable loss of fish or wildlife which cannot be mitigated."

House Proposals

The House Commerce Committee version of HR 4985 contains the most stringent language of any of the bills. Supported by Representative Dingell, it would allow the EMB to recommend to the President that he waive any federal, state or local requirement which the EMB determines presents a "substantial...impediment to the making of any agency decision" in accordance with the Project Decision Schedule or is promulgated after the Schedule is in place. A presidential waiver would take effect if neither house of Congress disapproves it within 60 days.

The House Interior Committee version of HR 4985 grants the EMB substantially less authority than any of the other legislative proposals. The EMB may set decision deadlines and may recommend to the President that he waive any federal time requirements and to the governor that he or she waive any state or local agency time requirements. However, the EMB may not waive substantive law. The President may make a federal decision if the responsible agency fails to meet its decision deadline. If a state or local agency misses a deadline, the only recourse the EMB has is to report it to Congress and recommend action to alleviate or prevent the delay.

Interior Committee chairman Udall in effect abandoned his committee's version of HR 4985 with his introduction October 19, of a substitute amendment for HR 4985. Udall and cosponsor Wirth concluded that the Interior Committee bill had some serious weaknesses which this bill seeks to correct. Another possible reason for introducing this bill is the realization that the Interior Committee bill had little chance of passage and the sponsors may have feared the House would go to the other extreme and approve the

Commerce Committee version. The Udall/Wirth bill is similar to the Senate-passed bill in that it allows the EMB to temporarily waive only those federal, state or local laws and regulations enacted or promulgated after construction of a priority energy project has begun. If a federal, state or local agency fails to meet a Project Decision Schedule deadline, the EMB may seek a court injunction to force the agency to act. If the court fails to make a ruling within 120 days or the agency fails to obey the court order, authority to make the decision would automatically be given to the President.

Miscellaneous: The EMB consists of a chairman and three members appointed by the President and confirmed by the Senate. The chairman will hold office at the pleasure of the President, while the three members will be appointed for terms of three years. The life of the EMB will be ten years, unless all priority energy projects are completed prior to that time, in which case the EMB will be abolished one year after the last decision on the final project is made. The EMB may:

- promulgate regulations and issue subpoenas;

- enter into any contract or other arrangement with any federal, state or local government agency or with any person;

- "accept and utilize the services of voluntary and uncompensated personnel";

- acquire and dispose of personal property.

Summary of Congressional EMB Legislation

Bill	Laws Which Can Be Preempted	How Waivers Would Work
Commerce Committee version of HR 4985	Any federal, state or local law or regulation.	EMB recommends waiver to President of requirements impeding decision schedule or promulgated after schedule is established; President waives law unless either House of Congress vetoes action within 60 days.
Interior Committee version of HR 4985	Only time requirements for federal actions can be waived. No preemption of state or local law permitted.	If federal agency fails to make decisions within EMB schedule President can make decision pursuant to federal law. If state or local agency misses deadline EMB merely reports failure to Congress.
Udall/Wirth substitute	Temorarily waive only laws and rules passed after project begins construction. If federal, state or local agency fails to act within EMB schedule the courts can order agency to act or if court fails to act or secure action by agency then President can make decision. When so acting, President must apply appropriate federal, state or local law.	EMB can waive new laws and regulations for maximum 5 years.
S 1308 (Passed by Senate)	Temporarily waive only laws and rules passed after project begins construction. EMB can make decisions in lieu of federal, state or local agencies, but must apply appropriate law.	Waiver of new laws and regulations would be permitted only if EMB so recommended and the President concurred.

State/Federal Cooperation in the Past

The Emerging "New Federalism". The concept of federalism has taken on a new perspective particularly over the last decade. The development of this new notion of the relationship between the federal sovereign and the individual states has been a function to a great extent of the increased awareness and concern for environmental values which come under attack with economic growth and development. Although environmental safeguards have been instituted through a variety of state and local mechanisms in the last three decades, one of the major incentives for development and implementation of statutes and regulations for the protection of the environment has emanated from the federal government.

The major force behind this federal regulatory scheme, which will be described below, has been the perceived notion that state and local governments are more susceptible to local special interest coercion and thus would not be inclined to enforce even the limited statutory and local ordinance restrictions that had been established by the states in the 1950's and '60's. As a direct result of this perceived recalcitrance on the part of the states to protect the environment, a virtual flood of environmental legislation was passed in the late '60's and throughout the 1970's beginning with amendments to clean air and clean water legislation.

The general scheme envisioned by the Congress to bring the states and local governments up to speed centered on the ultimate threat of federal preemption of state and local authority in situations where environmental programs were not instituted and enforced effectively. Thus, we see the Congress initially preempting state and local authority to regulate sources of air and water pollution followed by an authorization for the states to develop regulatory programs which would have to be approved by the federal sovereign before the states would be permitted such authority. Even after state programs are approved, though, the federal agencies supervise program implementation and enforcement with the ever-present threat of preemption sitting as the cornerstone of this "new federalism."

The format for these methods of state/federal cooperation that have developed over the last 15 years consists of four major facets:

- federal preemption of state and local regulatory authority;
- establishment by the federal government of "minimum performance standards" which are applied uniformly across the country and which serve as the basis for development of state programs;
- federal approval of state-developed programs is followed by an authorization to the states to implement and enforce these programs; in most instances, state program standards may be more stringent than federal minimum requirements;
- finally, the federal agencies' presence continues to drive the system through the continual development of new regulations, amendments to existing legislation and the omnipresent threat of preemption should the states not live up to minimum federal mandates.

The major pieces of federal legislation which follow this general scheme include the Clean Air Act, the Clean Water Act, The Surface Mining Control and Reclamation Act, the Occupational Safety and Health Act, the Safe Drinking Water Act, the Coastal Zone Management Act, and the Atomic Energy Act.[1]

As a direct result of the imposition of many federally mandated responsibilities, then, the states have developed, submitted, received approval for, and implemented environmental protection and human safety programs which impact every proposed natural resource development project in the states.

Interestingly enough, though, while the Congress and the administrations of the past four Presidents have instilled the environmental ethic in some states and have reinforced what was already a deeply entrenched philosophy in other states, President Carter's Administration and apparently the Congress now have developed a new and frightening use for the preemptive tool. The Energy Mobilization Board (EMB) as proposed by the White House and as deliberated by the Congress may be authorized to preempt state and local authority in the very field that the states have been, in some instances, coerced into regulating. The EMB may be allowed to short-circuit state and local substantive laws and procedural mechanisms for environmental protection when delays are perceived by the federal sovereign to violate the "national interest."

Setting aside for purposes of this report questions of the constitutional propriety of such reliance on the general preemptive tool by a federal sovereign, other more practical questions have focused state government attention on the value of federal dominion in areas that have traditionally been assumed to be subjects of state and local responsibility. Specifically, states continue to assert their predominant and overriding interests for local control of the development and exploitation of natural resources within state boundaries.

Developing Cooperation in the West. In the Western region, in particular, the federal presence increases and the attendant state-federal conflicts are exacerbated due primarily to the massive amounts of land that are owned and managed by the federal government. In the twelve states lying West of the 100th meridian (excluding Hawaii), the amount of federally owned real estate ranges from a peak of over 90% in Alaska, through the middle ranges of 66% and 48% in Utah and Wyoming respectively, to a low of 29% in Washington. At least a third of each Western state, then, is owned, managed and jealously safe-guarded by the federal government. Unfortunately, federal lands are not situated in neat, compact, and contiguous parcels. The interspersed and "checker-boarded" nature of federal land holdings lying among private fee land as well as state-owned land, expands the divisive attitude among the various levels of government as well as the private sector.

[1] The Atomic Energy Act establishes an "agreement state program" which allows the states to assume jurisdiction over certain "byproducts, source, and special nuclear materials" for purposes of protection against radiation hazards. Areas that remain the province of the federal government include: construction and operation of production and utilization facilities; export and import of nuclear materials and facilities and possession of near weapon quantities and grades of special nuclear materials; and disposal of nuclear waste materials. Twenty-five states participate in the program. Ten are in the West, inlcuding: Arizona, California, Colorado, Idaho, Nebraska, Nevada, New Mexico, North Dakota, Oregon, and Washington.

With the many delays and frustrations that private resource developers have experienced as a result of the public's increased awareness of the need for environmental protection and human safety as well as the federal presence has come a growing realization that traditional mechanisms for addressing conflicts between varying interest groups have failed to adequately produce expeditious development of our resources. Courtrooms are necessarily adversary settings. Administrative hearings more often than not take on the air of adversary proceedings as do Congressional deliberations.

Much of the anxiety that develops among interested parties over natural resource development projects, though, can and has been alleviated through the use of effective, but necessarily relatively new, cooperative mechanisms that the states, local governments, and federal agencies have instituted in ad hoc situations. Although the concept of these cooperative activities is certainly simple, implementing the coordination needed for any particular project is often tedious and can last for many months and often years before resolutions of the many problems unfold. Fortunately an increasingly large number of professionals involved in these projects realize the tremendous potential for alleviating conflict by departing from traditional modes of compromise, (i.e., the courts and the Congress).

Despite the problems inherent in instituting new machinery for conflict resolution, the states see little benefit for initiating the preemptive capacity of the federal government through agencies like the proposed Energy Mobilization Board. Other methods of resolving problems in the siting of energy projects, as well as the regulation of resource development, have been successful in several Western states and are adequate to meet the objectives of the many parties involved in such controversial developments as an oil shale operation or a coal liquefaction plant. In fact, as suggested by a recent study completed by the National Governors' Association (NGA), project development delays emanate primarily from federal agency involvement rather than state and local government related problems.

Two examples of new methods of coordination that have been developed here in the Western region will provide the background for the next section of this report which outlines our recommended approach for state/federal cooperative efforts.

The Colorado Joint Review Process. What is the Joint Review Process? -- The Joint Review Process may be defined as:

> A voluntary, intergovernmental review procedure which coordinates existing regulatory reviews between the three levels of government, provides the public with additional opportunities to become involved in all phases of project planning and review, provides industry with additional opportunities to increase public awareness of project plans and promotes government by cooperation and compromise rather than "government by ambush".

It is important to note that the Joint Review Process is not an attempt to develop an energy facility siting procedure or to change established regulatory programs, existing lines of authority or existing responsibilities of regulatory agencies.

Generally, the Joint Review Process is designed to address major energy or mineral resource development proposals. A broad definition of "major" has been developed for use in determining those projects that are "major" in character. A major project is one which will probably result in significant impacts, will involve regulatory decisions from two or more levels of government, and/or which is or may in the future become significant and controversial.

The Joint Review Process is a voluntary procedure. It offers industry an organized and systematic alternative to the existing fragmented and uncoordinated array of governmental reviews.

The process brings the three levels of government together in a common forum with the proponent on a regular basis to discuss governmental requirements, project plans and related issues and concerns.

It is designed to apply only to those projects that have recently completed the initial exploration phase and are about to commence design and feasibility studies.

The process is currently designed to address any of the following projects:

1. Coal mines
2. Uranium mines and/or mills
3. Oil shale development
4. Other metal mining developments

Finally, the process is designed to provide the public with additional opportunities to participate early, continuously and informally throughout the review of a major project.

How Does the Joint Review Process Operate? -- There are three stages in the Joint Review Process.

Stage 1 commences upon the initiation of an industry proponent. The proponent must notify the Department of Natural Resources that it is interested in considering the Joint Review Process alternative. The Department will ask the proponent to complete a general project description questionnaire. Based on that information, the Department will evaluate the project to determine if it qualifies as a major project and if the project is in an early stage of planning (i.e., completion of exploration or beginning of design/feasibility). The Executive Director of the Department will consult with principal agencies in state, local and federal government to determine if those agencies would be willing to participate in a joint review. The director will formulate a recommendation and seek concurrence from the Governor's Cabinet. If the Cabinet's decision is affirmative, the Governor will assign a state lead agency.

Stage 2 commences upon the Department's receipt of an affirmative answer from the Cabinet. During this six to seven month period numerous organizational activities will occur which include the following:

1. Through a process of negotiation, federal and local government coordinating agencies will be identified. These agencies will be responsible for coordinating all agencies within their respective levels of government.

2. A Joint Review Team will be organized, which will be comprised of the three lead agencies and the proponent. The team has no decisionmaking authority. Its function is to coordinate.

3. A cooperative agreement will be signed by the state, federal and local coordinating agencies and the project proponent. The agreement will simply state that each party will agree to participate in the joint review and will cooperate, communicate and coordinate with all other parties. A similar agreement was signed for the Mt. Emmons review on June 28, 1978.

4. A Statement of Responsibilities will be signed. This statement will list the responsibilities of all agencies at all three levels of government that have a regulatory or review responsibility associated with the project. The proponent will also list his responsibilities. A similar statement was recently completed for the Mt. Emmons project.

5. An inter-agency meeting will be conducted with all responsible agencies from the three levels of government and the proponent present. The proponent will provide the agencies with a description of the proposed project. The agencies will in turn provide the proponent with a listing of the permits, approvals and reviews that are likely to be required for the proposed project.

6. Two public information meetings will be conducted at which time the proponent will be asked to present a description of his project and respond to questions raised by those in attendance.

7. Two public scoping meetings will be conducted. At these meetings the public will have the opportunity to express concerns and raise issues about the proposed project. If an environmental impact statement is required, these meetings will be coordinated with the federal lead agency's scoping process required in the new Council on Environmental Quality NEPA regulations.

8. The Joint Review Team will prepare a decision schedule which will coordinate the proponent's proposed timetable for planning and development activities; the major federal, state and local regulatory processes; additional public participation activities; and joint review procedures. This decision schedule will be based on model schedules provided in the Joint Review Process Manual. Since the process is voluntary and depends on cooperation, several agreements may be needed to coordinate various agency schedules with the proponent's schedule.

Stage 3 commences upon completion of the decision schedule. It entails implementation of that schedule and will include such activities as preparation of an Environmental Statement (if one is required), completion of required regulatory reviews, completion of the proponent's design and feasibility studies, public participation and continuous Joint Review activities to ensure coordination. Major permit processes will be sequenced so that all final decisions will be complete at the time the proponent anticipates start of construction.

Utah's Intermountain Power Project. In 1974, the Intermountain Consumer Power Association and a group of California municipal utilities joined together to examine the feasibility of constructing and operating a large electrical generating facility in the state of Utah. Based on engineering and siting studies they selected a site near Hanksville in central Utah. The proposed site was approximately 10 miles east of Capitol Reef National Park.

As work on the site proceeded, it became apparent that prevention of significant deterioration standards proposed by EPA, and later legislated by the Clean Air Act Amendments of 1977, would be violated. Secretary of Interior Cecil Andrus indicated that he would not authorize a variance from the PSD requirements if a comparable alternative site could be found that did not require a variance.

In August 1977, after discussion with Secretary Andrus, Governor Scott Matheson created the Interagency Task Force on Power Plant Siting and requested that it review possible alternative sites and report to him. The Task Force included the 18 member Utah Energy Conservation and Development Council (established by law), representatives of five Federal agencies (Dept. of Interior, BLM, Forest Service, National Park Service, and Bureau of Reclamation) and seven representatives of local elected officials throughout the state. (See list of members at p. 65.)

The Task Force represented commitments from Secretary Andrus, Governor Matheson, and local officials. Federal and state agencies provided written and verbal technical analysis to the Task Force. The Task Force considered socioeconomic, water, ecological, land use compatibility, and economic siting factors and on the basis of a computation of numerical siting matrices recommended that IPP consider alternative sites at Hansville (near the original site) and Lynndyl (over 100 miles northwest of the original site).

Air quality studies projected that the Hanksville site would require a variance to meet PSD requirements at Capitol Reef. The Lynndyl site showed no violations.

In December of 1977, Secretary Andrus "directed the Bureau of Land Management, the National Park Service and the Bureau of Reclamation to continue their work on review of proposed sites for IPP as expeditiously as possible".

In April of 1978, the participants of IPP (after some preliminary engineering work) indicated that they would be willing to study the Lynndyl site as an alternative. Applications for the required permits were filed with BLM in May of 1979. The Draft Environmental Statement covering the site was released by BLM on July 10, 1979.

The Siting Task Force has followed the progress of IPP closely since the 1977 recommendations were made, but has not played a role in the environmental review or the permitting process. The Task Force, which has since reviewed several projects, views its role as a planning function. Ideally, the Task Force review will identify major siting problems before time and resources are invested in an unacceptable site. Developers can utilize the Task Force as a public forum to

surface potential problems early in the planning process. Utilities that have worked with the Task Force feel that the review can expedite the NEPA and permitting processes. It is too early to determine if this optimism is deserved. Each proposal has unique circumstances and problems. The flexibility offered by the Task Force approach is particularly useful.

There are clearly some logistical weaknesses in the process which must be worked out before the methods used in the task force project can be extended to other projects. If project reviews are performed early in the planning effort, so that maximum flexibility in project design exists, the information available may be so limited that potential problems are overlooked. The most important ingredient to a successful effort is the commitment, at decision-making levels, of all the participants to ultimately reach an acceptable decision. Once this committed understanding becomes a common thread in the project, it is simply a matter of time before compromise will be reached.

INTERAGENCY TASK FORCE ON POWER PLANT SITING
(as of 9/20/77)

Roger Markle, Chairman	
Senator Edward T. Beck	
Senator Ivan Matheson	
Representative Glade Sowards	
Representative Mike Dmitrich	
Dr. George R. Hill	
Dr. Joan Coles	
Val Finlayson	(Energy Council Members)
Cyrus M. McKell	
Marjorie (Peg) Billings	
Lee Kapaloski	
Mayor Ted Wilson	
Commissioner Calvin Black	
Dr. Lyman Olsen	
James Edwin Kee	
Gordon Harmston	(Ex-officio members of
Michael Gallivan	Energy Council)
Beth Jarman	
Paul Howard, BLM	
Jeff Sirmon, Forest Service	
James Isenogle, Park Service	(Federal Representatives)
David Crandall, Bureau of Reclamation	
Robert S. Sanchez, Jr., Dept. of Interior	
Mayor Walter Axelgard	
Mayor Hollis Hullinger	
Mayor Desmond L. Anderson	
Mayor Evan Colledge	
Commissioner Merrill MacDonald	(Local Representatives)
Commissioner Dwight Williams	
Commissioner Ron Sessions	

A RECOMMENDED APPROACH TO COOPERATIVE EFFORTS

Introduction. The member governors of the Western Governors Policy Office (WESTPO) met on July 21, 1979 in their capacity as a western Regional Energy Advisory Board (REAB) to the U.S. Department of Energy (DOE). At the July 21 meeting, the WESTPO governors outlined their four-point "Affirmative Action Plan to Move America Toward Energy Self-Sufficiency." The plan calls for:

- A Phased Process for Synfuels Development, as contrasted with the President's proposed "crash" program;
- State/Federal Partnerships to achieve short-term energy conservation as the most reliable short-term solution to our energy problems;
- State/Federal Partnerships to mitigate undesirable socio-economic impacts; and
- Improved intergovernmental consultation and concurrence.

As the four point plan indicates, and as the previously mentioned precedents for state/federal cooperation dictate, mechanisms presently exist which can be refined and used in the future to meet particular circumstances that will obviate the need for extreme "crash" programs for synthetic fuel development. Most importantly, these mechanisms have been shown to work effectively in stimulating cooperative processes between each level of government as well as the private proponents of a particular energy project and other special interest groups. Whether or not the proposed preemptive capacities of the proposed Energy Mobilization Board are constitutional, such drastic federal preemptive measures are simply not needed to ensure timely development of our energy resources. Other mechanisms have and will continue to work effectively.

A recent report completed by the National Governors' Association (NGA) entitled State Initiatives in Expediting Facility Siting Review Procedures indicates rather strongly that state actions or inactions are generally not the cause of energy project delay. Further, the report indicates that, "most delays which do occur are unavoidable, occurring as a result of incompleteness of information, changes in the project, or judicial appeal." Finally, the report addresses the capabilities of the federal government and emphasizes,

> "The federal government is generally not better equipped to do site specific facility siting evaluations than are the states. The states are better suited than the federal government to know for a particular site what data and information needs to be collected. . . .
>
> These factors suggest that there are far more effective approaches to the process of expediting energy facilities than enforcing time deadlines or preempting state reviews." (emphasis added)[1]

[1]"State Initiatives in Expediting Facility Siting Review Procedures," National Governors Association, August 1, 1979, at pp. 4, 5.

Recommended State/Federal Cooperative Efforts. The basic outline of what we propose as an affirmative action plan centers on a cooperative partnership between the federal government and each of our respective states. The Western states have committed themselves to be a major resource to the President and the Congress in meeting our national energy objectives.

The proper functioning of a cooperative state/federal effort should address three primary issues:

- the identification of cooperative state/federal institutions;
- the provision for funding of such mechanisms; and
- the implementation of a working relationship between local, state, and federal agencies.

As such, states should be "built into the process" for 1) designating priority energy projects; 2) setting cooperative timetables; and 3) defining the scope of such efforts for expediting these energy projects.

We recognize that delays have in fact occurred at every governmental level in production of the country's energy resources. Nevertheless, coordination of sometimes overlapping and duplicative efforts has greater potential for expediting energy projects than would piecemeal or wholesale preemption of applicable regulatory safeguards. The following are some suggested areas where increased attention to cooperative mechanisms will reap tremendous rewards.

- Concurrent environmental reviews. For any energy project, whether it is a power plant, oil shale mining and retort operation, coal liquefaction plant, or any number of other projects, each federal agency affected by the proposal must determine whether an environmental impact statement must be prepared pursuant to the National Environmental Policy Act (NEPA). As well, several states have now instituted "mini-NEPA's" which are designed to provide a similar type of environmental review for projects involving state regulatory agencies. Finally, some local units of government attempt to complete environmental reviews.

Recent regulations issued by the Council on Environmental Quality (CEQ) will provide a certain degree of cooperation and coordination among federal agencies to avoid duplicative efforts in preparation of needed EIS's. The regulations also attempt to draw state and local government and environmental interest groups into the process. As yet, the new mechanisms envisioned by CEQ to avoid unnecessary paper work and eliminate duplication are unproven. Nevertheless, concurrent environmental reviews appear to be one of the major areas for reducing the time needed to get an energy project started. The potential for cooperation is enormous. New energy projects appear as well to be an effective testing ground for these new approaches to environmental review.

- Authorization for energy project applications to be submitted jointly to federal and state agencies. Many of the Western region's synthetic fuel developments will occur in areas of checkerboard and interspersed federal, state and private fee lands. Applications for mining permits for a coal liquefaction plant, for example, presently are distributed to federal agencies for their independent review and to state agencies for independent review. Although regulatory objectives are not always identical at each level of government, enough similarities exist to permit joint review of mining applications. In fact, each level of government may benefit greatly from the experience and expertise that separate agencies possess.

• Provision for joint state/federal hearings and permitting procedures. A natural extension of submission of joint mining applications to state and federal agencies would be the provision for instituting joint permitting procedures and perhaps joint state/federal public hearings. Such provisions would necessarily entail establishing concurrent timetables for environmental reviews as well as similar timetables for other permitting requirements.

• Joint State/Federal Site Selection. Particularly for power plant siting, cooperative federal/state teams could be established as was the case in Utah for the Intermountain Power Project. These teams would have the opportunity to share technical and environmental data and make use of agency expertise to make site selection decisions.

• Early state expressions of acceptable development levels for particular locales. Synthetic coal developments, in particular, will be the subject of renewed interest in federal coal. As mentioned earlier, the interspersed nature of federal, state, and private lands in the West increase the interest and responsibility of state agencies in areas where federal coal is being developed. The attendant socio-economic and environmental impacts from particular developments may dictate that states will have a vested interest in seeing development occur in certain areas. These early expressions of state priorities will help guide the Department of Interior in its new federal coal management program and may lessen what might otherwise be major conflicts between federal and state objectives.

• Implementation of new cooperative mechanisms among state, federal, and local governments as well as project proponents and special interest groups. Finally, and perhaps most importantly, methods of coordinating the responsibilities and interests of all interested parties must be refined and new ones developed to ensure close cooperation and create innovative avenues to conflict resolution. Each state, federal and local governmental unit has different and at times overlapping responsibilities regarding any major natural resource development. As well, different agencies within the federal establishment are not fully aware of other federal agency requirements, either substantive or procedural. The same is true with state and local government.

Beyond regulatory responsibilities, though, each level of government and certainly project proponents and environmental organizations have conflicting objectives which more often than not can be compromised to ensure reasonably timely resource development. Institution of innovative cooperative approaches to these problems, similar to the Colorado Joint Review Process and the Utah State/Federal Siting Team, must become the primary objective of all interested parties. Often the adversary nature of our court system, our administrative hearing system, and certainly our legislative forums does not permit detailed and equitable compromises to rise to the surface particularly with regard to natural resource projects. Certainly federal preemption of state and local regulatory requirements is not now nor will it ever be acceptable to the states within whose borders actual development projects will take place.

APPENDIX A

IMPACTS FROM PRESENTLY ENVISIONED PROJECTS

Table A-1: Planned Powerplants

TABLE A-1

PLANNED POWERPLANTS[1] (Operation dates after 1980)

Name & Location	Capacity	Commercial Operation Date	Permanent Labor Force[2]
Colorado			
Craig 3, Craig, CO	400 Mw	7/83	96
Under consideration are:[3]			
Colorado Ute Electric Assn., and Moon Lake Electric Assn., northwest Colorado	1760 Mw	unknown	422
Moon Lake Electric Assn., Rangely, CO	250-1000 Mw	unknown	60-240
Colorado Ute Electric Assn., Craig, CO	760 Mw	unknown	182
Montana			
Colstrip, Colstrip, MT	Unit 3 700 Mw	7/83	
	Unit 4 700 Mw	5/84	(3 & 4) 336
Montana Power Co., location uncertain	350 Mw	1989	83
Basin Electric Power Cooperative, location unknown	Unit 1 500 Mw	1988	120
	Unit 2 500 Mw	1993	120
New Mexico			
Basin Electric Power COOP, Mercer County			
Antelope Valley 1	416 Mw	11/1/81	108
Antelope Valley 2	416 Mw	11/1/83	(1 & 2) 160
Coyote 1, Mercer County	390 Mw	5/1/81	70
Utah			
Hunter, Emery County	Unit 3 400 Mw	6/83	
	Unit 4 400 Mw	6/85	(3 & 4) 192
Intermountain, Lynndyl	Unit 1 750 Mw	1/86	180
	Unit 2 750 Mw	1/87	180
	Unit 3 750 Mw	1/88	180
	Unit 4 750 Mw	1/89	180
Warner Valley, St. George, UT	Unit 1 250 Mw	6/84	
	Unit 2 250 Mw	6/85	(1 & 2) 120
Deseret	400 Mw	1986	96
Wyoming			
Osage, Osage, WY	100 Mw	6/85	24
Laramie R. Station 3, Wheatland, WY	500 Mw	4/82	120

[1]Sources: State agencies; "MAPP Generation and Transmission Report 1978-1987," Mid-Continent Area Power Pool, June 1978; "WSCC Ten-Year Coordinated Plan Summary 1979-1988," Western States Coordinating Council, May 1979; "Region 8 1977 Power Plant Summary," U.S. Environmental Protection Agency, March 1978.

[2]Calculated (for all but North Dakota's powerplants) from the formula that a 2000 Mw powerplant required 475 permanent employees. *Air Quality and Energy Development in the Rocky Mountain West,* Los Alamos Scientific Laboratory, September 1977. The North Dakota data is from the "Final West Central North Dakota Regional Environmental Impact Studies on Energy Development," U.S. Department of Interior, 1978.

[3]"Final Environmental Statement on Northwest Colorado Coal," U.S. Department of Interior, 1976.

APPENDIX B

"POTENTIAL PRODUCTION OF SYNFUELS FROM COAL, OIL SHALE, AND OIL SANDS"

from "Overview of Synthetic Fuels Potential to 1990" prepared for Synthetic Fuels Task Force of the Senate Budget Committee, Cameron Engineers, August 1979.

POTENTIAL PRODUCTION OF SYNFUELS FROM COAL, OIL SHALE, AND OIL SANDS

BASIS FOR ASSESSMENTS

Synfuels production potentials are postulated for the years 1985 and 1990 for three different cases:

Case I - "A good commercial test program will be initated", the objective being to establish a proven technology base which can be relied upon as the foundation for a synthetic fuels industry. Any project which is economically viable on its own merits will receive government encouragement, and a limited number of first-of-a-kind commercial plants will receive incentives. There will be no widespread removal of impediments. Promising technologies which are not currently economically viable, but which are expected to become so, will be supported by the government to establish a proven technology base which is operable at the commercial scale.

Case II - A significantly accelerated program, which in addition to establishing a strong technological basis, is intended to achieve a maximum production of synthetic fuels without incurring major distortions in the economy or infrastructure. Government action would be taken to remove impediments for such a program.

Case III - A national "crash" effort would be undertaken to install maximum production capacity. Such an effort would be constrained only by the lack of resources, water supplies, logistical factors, or by the engineering and construction capabilities of the Nation. Distortions of the economy and infrastructure would be expected.

CASE I - TEST PROGRAM

Shale Oil

Under a test program, the only production of shale oil which can be expected by 1985 results from single commercial-scale modules of surface retorts, and production from pre-commercial modified in situ or true in situ retorts. No comercial scale plants will be on line until after 1985. Table 13 presents our estimates of oil shale production potential under Case I. These estimates are based on the current status of oil shale projects.

By 1990 the initial commercial-scale plants can come on-line. Because of the long leadtimes required to assemble a commercial oil shale venture, the only commercial scale plants currently envisioned for 1990 will be those which are identifiable as projects today. Additional production will also be obtained from modules of newly developed technology. The probable production range represents a discount on the total because of the likelihood: (1) that initial plants will require several years to reach design production (2) of some schedule slippage, and (3) that not all of the developing technologies will prove viable.

TABLE 13

SHALE OIL PRODUCTION - Case I

Project Name	Shale Oil Production (Barrels of Oil Per Day) 1985	1990
Union Oil, Long Ridge Project	9,000	9,000
Rio Blanco Oil Shale Co. (C-a tract)	2,000	76,000
C-b Oil Shale Project (C-b tract)	1,000	57,000
White River Oil Shale Project (U-a/U-b tracts)	—	10,000
Paraho	4,000	4,000
Colony Development Company	—	46,000
Tosco Sand Wash Project	6,000	6,000
Superior Oil Project	—	4,000
Geokinetics	1,000	1,000
Equity	1,000	1,000
Other Entrants (Currently Unidentified)	1,000	9,000
TOTALS	25,000	223,000
PROBABLE RANGE	10,000 - 25,000	100,000 - 150,000

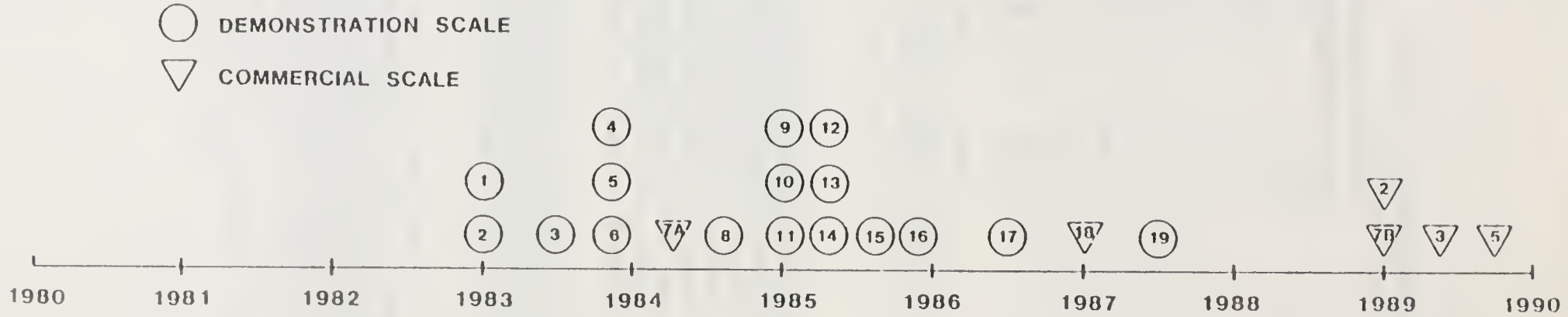
Coel

From the coal conversion processes which were listed in Table 8, we have identified those which will be in a position to enter the demonstration and commercial stages before 1990. Figure 3 presents a time-line with the entry points shown for different technologies along that line. The appearance of a technology on the time-line does not indicate that all of these processes will actually progress to the demonstration scale. Many will be eliminated as a result of work which is currently underway. As technologies are developed at the demonstration plant scale, some will not offer any benefits over competing processes and will not advance to the commercial scale.

A sound test program will establish a U.S. base for the proven technologies. The identity of these successful technologies will be very dependent upon the outcome of the demonstration programs. However, we would expect the prime contenders to be the Slagging Lurgi process, the Texaco Partial Oxidation process (possibly in a methanol synthesis facility), and the SRC-II process.

We have assumed that the first phase of the Great Plains Gasification Plant will be the only commercial project to come on-stream by 1985. This is dependent upon rolled-in pricing and an All Events Tariff. With sufficient incentives, a Fischer-Tropsch plant could be viable by 1987. Successful second generation technologies could begin commercial operation by 1989, but it is unlikely that more than one of the three would be on-line at full scale commercial operation by 1990. Other second generation technologies would come on-stream after 1990.

FIGURE 3
PROCESS DEVELOPMENT SCHEDULE FOR TEST PROGRAM



1 - COGAS
2 - Slagging Lurgi
3 - Texaco Partial Oxidation
4 - SRC - I
5 - SRC - II
6 - U-Gas
7a - Great Plains - Phase I
7b - Great Plains - Phase II
8 - HYGAS
9 - Exxon Donor Sovent
10 - H-Coal
11 - Shell-Koppers
12 - Saarberg - Otto
13 - Ruhr 100
14 - Combustion Engineering
15 - Molten Salt
16 - Dow Liquefaction
17 - Exxon Catalytic Gasification
18 - Fischer-Tropsch
19 - Rocketdyne

Oil Sands

While the oil sands resource is large enough to support commercial size development, no major development effort appears forthcoming over the short term. Therefore no oil sands production is projected under Case I.

Case I Summary

Based upon our analysis and assigning probability factors, we expect the range of synfuels production in 1985 and 1990 to be:

Production Potential - BPD of Crude Oil Equivalent

	1985	1990
Oil Shale	10,000 - 25,000	100,000 - 150,000
Coal	50,000 - 75,000	100,000 - 150,000
Oil Sands	—	—
TOTAL	60,000 - 100,000	200,000 - 300,000

The cost of a Case I program cannot be projected accurately because of the large mix of technologies and because the cost of production from demonstration plants will be much higher than for commercial plants. However, for scoping purposes, if oil shale production is estimated to cost $25,000/daily barrel, and synfuels from coal are estimated to cost $40,000/daily barrel the total cost of the Case I program would be $2 - 4 billion by 1985 and $6.5 - 9.8 billion by 1990.

CASE II - ACCELERATED PROGRAM

Oil Shale

Shale oil production by 1990 under an accelerated program would increase significantly from projected Case I 1990 production because impediments (financial, regulatory, etc.) would be removed allowing currently planned projects to proceed. In addition, an atmosphere favorable to oil shale development would most likely lead to more rapid development of modular to commercial type projects. Other parties not now active in oil shale projects, but who maintain a position in oil shale ownership, would also be expected to participate. Table 14 presents our estimates of 1985 and 1990 shale oil production potential under the influence of an accelerated program based on the current status of shale oil projects.

The lower projection for 1985 relative to the 1990 production results from the lead time required to get a large facility into sustained operation. It is anticipated that a major portion of the production increase between 1985 and 1990 would come on stream in stages during the five year period.

Some projects are ready to proceed, with portions of the detailed design and engineering complete. Significant effort has also been expended in acquiring some of the required permits. This "holding pattern" can be broken with the removal of impediments and granting of financial incentives.

TABLE 14

SHALE OIL PRODUCTION - Case II

Project Name	Shale Oil Production (Barrels of Oil Per Day) 1985	1990
Union Oil, Long Ridge Project	9,000	50,000
Rio Blanco Oil Shale Co. (C-a tract)	5,000	76,000
C-b Oil Shale Project (C-b tract)	5,000	57,000
White River Oil Shale Project (U-a/U-b tracts)	—	100,000
Paraho	4,000	4,000
Colony Development Company	25,000	46,000
Tosco Sand Wash Project	10,000	50,000
Superior Oil Project	1,000	25,000
Geokinetics	2,000	2,000
Equity	1,000	1,000
Naval Oil Shale Reserves	—	—
Other Parties (Currently Unidentified)	1,000	50,000
TOTALS	63,000	441,000
PROBABLE RANGES	45,000 - 60,000	300,000 - 400,000

Coal

Under an accelerated engineering program, impediments are removed which are blocking the widespread introduction of coal synfuels plants. A major objective is to achieve a high level of synfuels production, while at the same time following a logical set of guidelines which will minimize cost, environmental impacts, and waste. Since coal synfuels will not be economical before 1990, the federal government must provide some type of financial incentive for each project. As a result, the government will maintain some degree of control over which projects are brought on-line. The following criteria should be considered in any such program:

- First priority should be given to removing impediments from those commercial projects which have been proposed and which have done considerable preparatory work, including commitment of coal and water resources.
- Establish streamlined procedures for acquisition of land, coal reserves, water rights, and permits for developers of synfuels projects.
- The synfuels plants should be dispersed among the coal regions to increase the flexibility of product distribution and to minimize the concentration of adverse environmental and socioeconomic effects.
- Initial plants will utilize existing technology, but a concerted effort should be made to avoid building a large inventory of plants utilizing one technology which could rapidly become obsolete.

- Establish a fast track for selected technologies which are particularly promising in order to minimize the time required to reach commercial scale.

- Establish a high priority for plants which can produce high grade liquid fuels such as methanol or Fischer-Tropsch liquids.

- Except for early commercial projects which are already site specific, initial plants should be located in less environmentally sensitive areas. Once the environmental impacts are clearly defined, better control systems can be designed for environmentally sensitive areas.

- Plants in the same region should be built in phases or with some overlap in construction schedules to level out socioeconomic impacts of large scale development.

By applying the above criteria, we developed the potential production schedules given in Table 15. Only the first phase of the Great Plains project could come on-stream by 1985. The schedule allows for approximately equal production of liquids (methanol, Fischer-Tropsch and SRC) and SNG. Production by 1990 would occur approximately 60% in the West and 40% in the East, due in large part to the difficulties of processing eastern coal in first generation conversion plants.

TABLE 15

POTENTIAL COAL SYNFUELS PRODUCTION FROM CASE II,
THE ACCELERATED ENGINEERING PROGRAM
(All Production From Commercial Plants)*

Year	Plant Type	Capacity, BPD**	Location
1984	Lurgi-SNG	21,000	Ft. Union Region
1985	Lurgi-SNG	11,000	San Juan
1986	Methanol	50,000	Ft. Union
	Lurgi-SNG	42,000	Powder River
	Fischer-Tropsch	50,000	Illinois Basin
1987	Methanol	50,000	Central Appalachia
	Lurgi-SNG (expansion)	31,000	San Juan
1988	Lurgi-SNG (expansion)	21,000	Ft. Union
	Methanol	50,000	Powder River
	2nd Generation-SNG	42,000	Illinois Basin
	2nd Generation-SNG	42,000	Northern Appalachia
1989	2nd Generation-SNG	42,000	San Juan
	SRC	50,000	Central Appalachia
	2nd Generation-SNG	42,000	Kaiparowits
	Methanol	50.000	Texas Gulf
	TOTAL	594,000	
	PROBABLE RANGE	400,000 -450,000 BPD	

*Production from demonstration plants will total approximately 30,000 - 55,000 BPD by 1985

**Crude oil equivalent; SNG plants have 250 MMSCFD capacity.

Oil Sands

Based on the status of current oil sands projects in the U.S. and the lack of interest in U.S. oil sands deposits, we believe that only minor production would be forthcoming by 1990. Relatively little effort has been expended to date and a long lead time is anticipated for adequate exploration and development planning prior to production of significant quantities of oil from oil sands processing facilities. The projected production for Case II is:

	1985	1990
Case II	5,000 Bbl oil/day	20,000 Bbl oil/day

Case II Summary

Production Potential - BPD of Crude Oil Equivalent

	1985	1990
Oil Shale	45,000 - 60,000	300,000 - 400,000
Coal	50,000 - 75,000	400,000 - 450,000
Oil Sands	5,000	20,000
TOTAL	100,000 - 140,000	720,000 - 870,000

Costs associated with Case II are also difficult to estimate. Little data exists on costs for U.S. oil sands development, but costs associated with Canadian projects would indicate oil sand processing costs are on the same order as those for oil shale If the same costs of daily production are used as for Case I, the estimated costs for Case II would be $3.2 to 4.6 billion by 1985 and $24 to 29 billion by 1990.

CASE III - CRASH PROGRAM

Oil Shale

Under a crash program, the requirements for maximum production of the most useful fuels at the lowest overall production cost, places major emphasis on oil shale development. Table 16 presents our estimates of the maximum production levels attainable under Case III conditions. Large-scale developments are targeted for each major oil shale property currently in existence. Many of the owners of existing blocks of property have conducted significant studies to date which would allow shorter lead time to production than from additional federal leasing. Over the long term, however, additional federal leasing would result in significantly higher production and greater numbers of participants.

At a production rate of one million barrels per day, over 2 million tons of oil shale will have to be mined daily, in addition to any overburden removed in surface mines. If, under a crash program, the availability of certain types of mining equipment becomes a limitation, more emphasis could be shifted to coal synfuels which do not require as much inert materials handling as does oil shale. Considerable logistical problems could

TABLE 16

SHALE OIL PRODUCTION - Case III

Project Name	Shale Oil Production (Barrels of Oil Per Day) 1985	1990
Union Oil, Long Ridge Project	25,000	150,000
Rio Blanco Oil Shale Co. (C-a tract)	50,000	300,000
C-b Oil Shale Project (C-b tract)	50,000	76,000
White River Oil Shale Project (U-a/U-b tracts)	—	100,000
Paraho	—	—
Colony Development Company	25,000	46,000
Tosco Sand Wash Project	10,000	50,000
Superior Oil Project	1,000	40,000
Geokinetics	1,000	10,000
Various True In-Situ Projects	1,000	10,000
Naval Oil Shale Reserves	25,000	100,000
Other Parties (Currently Identified)	30,000	150,000
TOTALS	218,000	1,032,000
PROBABLE RANGES	100,000 - 200,000	700,000 - 1,000,000

also be anticipated in bringing 1 million barrels of shale oil production on stream in this undeveloped area in such a short time span.

Coal

It is our assumption that, under a crash synfuels program, oil shale will be the resource which will be developed under top priority. Coal will function as a swing variable in that production will be in excess of that outlined for Case II, up to the level imposed by logistics or engineering/construction capability constraints.

The conditions which would lead to a crash synfuels program would also likely call for substantial increases in coal production for direct combustion. The availability of mining manpower and equipment would then become a probable constraint. An allocation of these resources would then be needed between production of coal for direct usage and for liquefaction/gasification.

Because of the long lead times for mine development and plant construction, it is unlikely that 1985 coal synfuels production could exceed 100,000 - 150,000 BPD. When the demands of the oil shale effort interact with the demands of the coal synfuels effort, the probable 1990 range of coal synfuels production would be 750,000 to 1,000,000 BPD.

Oil Sands

Under the crash program conditions, we estimate that 10,000 BPD of production would be on-stream in 1985, and one 50,000 BPD oil sands plant would be in operation by 1990.

Case III Summary

Production Potential - BPD of Crude Oil Equivalent

	1985	1990
Oil Shale	100,000 - 200,000	700,000 - 1,000,000
Coal	100,000 - 150,000	750,000 - 1,000,000
Oil Sands	10,000	50,000
TOTAL	210,000 - 360,000	1,500,000 - 2,050,000

The probable capital investment required for a crash program is truly unpredictable. If the scoping costs used for Cases I and II are applied to a crash program, the capital investment would be 6.8 to 11.2 billion dollars by 1985, and 48.8 to 66.2 billion dollars by 1990. However, under a crash program, equipment shortages will abound, and the costs of building synfuels plants will undoubtedly enter a period of hyperinflation.

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